THE QUARTERLY BULLETIN

OF THE

STATE PLANT BOARD

OF FLORIDA

Contents and Index

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THE QUARTERLY BULLETIN

State Plant Board of Florida

Vol. XI October, 1926 No. 1

THE JAPANESE BEETLE

(Address delivered by J. R. SPRINGER before the Citrus Section, Farmers' and Fruit Growers' Week, August, 1926)

There is present, right now, in the United States a menace to agriculture which is almost as great a scourge as that of the locusts mentioned in the Bible. This pest, known as the Japanese Beetle, is firmly established in New Jersey, Pennsylvania and Delaware. Through the courtesy of Mr. Loren B. Smith, Entomologist in charge of the Japanese Beetle Project under the direction of the United States government at Riverton, New Jersey, I was given an exceptional opportunity this summer for studying the situation as it now exists in New Jersey. It is my object to make this discussion as non-technical as possible, but still impress upon you the dangers attending the possible introduction of this insect into Florida.

The beetle was introduced into the United States prior to 1916, but it was not discovered until that date. It probably came in soil around the roots of iris plants which were imported into the Riverton section by one of the large nurseries there. It was no doubt introduced in the larval or grub stage. Both of the speakers who preceded me had pictures with which to illustrate their subject matter and, not to be outdone, I have brought some Riker mounts which show the insect itself and the injury which it does to the foliage of plants.

The life cycle of the Japanese Beetle in New Jersey covers a period of about one year, twelve months. Nine months of this time is spent in the soil as a grub, shown in the little vial in the Riker mount. During these nine months, except for a short period of dormancy in cold weather, it is feeding on the roots of grasses and various kinds of plants. During the three months when the adult emerges from the soil and is on the wing flying actively, it attacks the foliage and fruit of practically all vegetation in New Jersey, and, I presume if it were introduced into Florida it would attack everything here. The number of host

*Assistant Nursery Inspector.

plants, as I have just indicated, is enormous. I am informed that over two hundred different plants which it attacks have now been actually counted. The adult beetle feeds on the foliage and fruit and gathers there in immense numbers. The damage to the foliage has a skeletonizing effect. All of the tissue between the veins is eaten out and then the plant, having no leaf surface to elaborate its plant food, gradually dwindles and in the course of a few years dies. Annual plants die down right away and never come up again.

The rapidity of increase and spread of this beetle since its introduction defies description. In 1916, when it was first discovered, the inspectors of the State of New Jersey found only twelve beetles, and these twelve beetles were collected in an area of less than one-half square mile. The following year, 1917, 2.7 square miles were found to be infested and several thousand beetles were collected. In 1918 the infested area had increased to 6.7 square miles; in 1919 to 48.3 square miles; and there were myriads of beetles in the centers of the severely infested areas. By the end of the season of 1925, the infested area had increased to 6,047 square miles and the numbers of beetles in the middle of this severely infested area were uncountable. They were there in countless millions, and I presume that I could say countless billions and still be conservative in my estimate.

I have here a map published by the Quarantine Department of the Japanese Beetle Project, which shows the present distribution of this beetle in the United States. Through the courtesy of Mr. Smith, who had it colored for me, I can show the severity of the infestation in the different parts of the whole infested area. This whole section colored light green is within the quarantined area and is the part that includes the 6,047 square miles. However, the part in purple, which is in the center, is an area approximately twenty miles in diameter in all directions and is the intensely infested area. In that area the beetles are present in swarms. In the area in yellow, if an inspector could go out and devote his entire day to collecting beetles, he could probably collect from five to ten thousand without any trouble. Out in this brownish area the number would probably be reduced to a thousand, while down here there may be only a few hundred, and so on into the quarantined green area in which no beetles have been located. Owing to certain geographical lines, it has been thought necessary to include it in the quarantined area. The

natural spread of the beetle on its own wings is approximately fifteen miles in every direction each year.

I am frank to admit that before I visited the infested area I had read much and had heard more about this beetle, and I was convinced that the reports circulated were greatly exaggerated, which is not infrequently true in regard to new pests. However, I can honestly say now that I could enlarge on any of the reports that I had read concerning the Japanese Beetle and still be within the truth. I wish I were able to give you an adequate description of the swarms of beetles that simply cover everything in this severely infested area, but my powers of description are inadequate. The few days preceding my arrival were the first warm days after the beetle had emerged from the ground. The beetle is not active unless the sun is shining brightly and the air is warm; consequently the damage up until the time of my arrival was rather slight and one would have to get close to a tree in order to see where any material damage had been done. The day on which I arrived and first went out into the orchards the thermometer gradually climbed to 95° and if there was any breeze blowing we did not discover it. It was *hot*. Doubtless you have been under orange trees in full bloom and have heard the buzzing and droning of bees as they visited the flowers. Visualize it—change the orange trees to apple trees and the bees to beetles and multiply the number as many times as you wish and you will have some idea of the swarms and hordes of beetles that were in this area. During the few days that I spent at the Japanese Beetle laboratory, I kept under observation a row of trees along the highway which had not been sprayed or treated for control. Four days later these trees were simply skeletons. During these four days the foliage just melted away and there was nothing left but skeletonized leaves hanging and fluttering in the breeze. Apples in severely infested orchards appeared as shining balls of beetles. The skin of the fruit was absolutely covered. I have an apple here which I picked from such an orchard. This particular apple was covered as I have just described. I took a wide-mouthed cyanide jar, slipped it over the apple, and after all the beetles on the apple were dead I counted 147 of them. If the apple had been larger I am certain there would have been more beetles on it. The infestation on truck crops, field crops, etc., up there was equally as severe as that on fruit. I saw baskets of green corn, with the butt ends of the ears up, by the

side of the road waiting to be carried to market. I believe they had been there about an hour and a half. The protruding butts of this green corn were just balls of beetles. I indiscriminately picked up one ear, shook off the beetles, and found that they had eaten off the silk. Upon husking the ear I found thirty-six of them on the inside.

The reaction of the beetles to light is very positive. That is, they will not stay in any dark place. For instance, while walking over heavily infested areas some of them will start to crawl up your trousers, but as soon as they get in the dark they will turn and go back. If they get into your pockets, they will come right out. Because of the beetle's preference of light to dark, the trees are attacked in a rather peculiar way. The tops and the outer growth are attacked first, but with the melting away of the foliage and the penetration of light to the inner portions of the tree, the beetles gradually move inside. Only a few days elapse before the foliage is in a skeletonized condition.

Lawns and golf greens also have suffered severely. The grubs, during the nine months that they live in the soil, feed voraciously. They come up to within two inches or so of the surface of the ground and eat up the roots of grass. The infestation in the ground may be so severe that it is not uncommon to find from five hundred to a thousand grubs per square yard, and they are so numerous that they can be raked up with the fingers.

While at the Japanese Beetle laboratory, I witnessed several demonstrations showing control methods. It has been discovered that the beetles are attracted by various odors, and particularly by a compound called geraniol. Geraniol is one of the ingredients in oil of geranium and other essential oils. An emulsified solution of geraniol was sprayed onto a tall tree in one of the orchards. Only a few minutes elapsed before the beetles on adjoining trees were attracted to it and as the odor spread out farther and farther from the sprayed tree they became very much excited, left the trees on which they were feeding and accumulated on this tree. It appeared that the beetles were being attracted as far as a quarter of a mile. The sprayed tree was left undisturbed only about twenty minutes, but during that time so many beetles had come that they hung in masses and the smaller limbs were bending under their weight. After enough beetles had gathered on the tree, it was sprayed with a contact insecticide called pyrethrum oleo resin. A powerful spraying

machine capable of delivering a large volume of spray per minute is employed. As the beetles are very active and easily disturbed the tree must be sprayed as quickly as possible or many of them would escape. The tree is therefore swept machine-gun fashion with the forceful, drenching spray in order to hit as many beetles as possible in the shortest time. The pyrethrum in the mixture paralyzes the beetles and they fall to the ground. The oleo resin does the final work of killing them. The ground under the sprayed tree was literally covered with the dying, squirming beetles. They were simply there in myriads.

Many beetles have also been successfully trapped, geraniol being used as bait. The traps consist of cages about the size of a gallon syrup can. Inside is suspended a shallow dish or pan with a hole in the middle. This dish is filled with bran impregnated with a solution of geraniol. In the hole in the dish is placed the spout of a funnel. The beetles, attracted by the odor of the geraniol, crawl into the funnel, hit the sides and fall through the hole in the funnel down into the catch basin in the bottom. On a day preceding my arrival the number of beetles caught in one of these trap-cans in twenty-four hours was, by actual count, 10,872. There were twenty-one traps in the orchard at that time and the record for that day was over 87,000 beetles.

The beetles will not eat the common stomach poisons used for poisoning other insects. If such poisons are sprayed onto a tree they merely act as repellents and the beetles cannot be induced to eat them. Therefore, a common practice which is now being followed, not for controlling the beetles but for protecting the orchards, consists in spraying the trees with a mixture of two pounds of flour and one pound of arsenate of lead in water. The whiter the coating on the leaf, the greater the repellent action. Not only arsenate of lead, but practically any sort of dust or any coating on the leaf will act as a repellent.

Several parasites of the beetle have been introduced from Japan and these seem to be making some headway. The results so far are at least encouraging and it is hoped that some of these parasites will effect, if not a complete control, at least a partial control in the future.

The beetles are very strongly attracted to each other. An apple may have two or three beetles on it, and in five minutes that apple will be covered about as I described the one I passed

around. If some repellent is used before the beetles emerge from the ground the prospect of getting through the season without damage to the crop is excellent; but if a few beetles come in, large numbers will follow until they fairly swarm.

The introduction of the beetle into Florida by natural spread is still remote. The spread, as previously stated, is about fifteen miles a year, and of course Florida is a thousand or more miles from the present known infestation. However, the introduction of the beetle by some artificial means is something to be pondered with great misgivings. It is not only possible to transport this beetle on living plants and in soil about the roots of nursery stock, but automobiles, trains, box cars, and in fact all vehicles that pass through the infested area while the beetles are flying are potential means of spreading this pest. The question of carrying it on nursery stock is one of vital importance to us. It has been the experience in the infested area that many of the plants which are moved with balls of earth around the roots are infested with the grubs. They are in the soil in the grub stage and it is quite possible to carry this beetle great distances, at least as far as the stock itself can be safely shipped, and an absolutely new infestation started in a single season. The federal and state authorities are giving the nurseries in the infested area as nearly perfect supervision as human agencies can devise. The work that they are doing is good, but they are working under tremendous handicaps. The beetle can fly considerable distances and it can be carried by other means. I am frank to admit that, in my opinion, all efforts to keep this beetle from spreading are doomed to failure. The authorities are doing good work and retarding its spread, but it is certainly going to get away sooner or later. The danger of introducing the beetle in nursery stock from the nurseries in the infested area is great, and I am firmly convinced that the horticulturists and agriculturists of Florida could do their state and their community a worth while service if they would order their ornamental plants from areas outside the infested district. What the result would be should the beetles get into Florida, we can only guess; but with our warm, sunny climate and twelve months of food supply, it need not stretch one's imagination a great deal to visualize a terrible scourge. The life cycle may be the same here as it is in New Jersey, or it may be different. We do not know. Under greenhouse conditions in New Jersey adult beetles have been reared in December

from eggs laid in June, and as our climatic conditions largely parallel greenhouse conditions, it is within the realm of probability that we might have two swarms of these beetles a year instead of only one, as they have in the North.

MOSQUITO SURVEY OF BAMBOO KEY, FLORIDA

By G. F. Moznette[1]

During the month of January, 1923, Dr. Joseph Y. Porter, President of the Key West Chamber of Commerce, wrote to Dr. L. O. Howard, Chief of the Bureau of Entomology, Washington, D. C., stating that he was going to send an inspector to Bamboo Key to investigate the truth of the report that there are no mosquitoes there, and to find out the reason for such absence if true. He requested Dr. Howard to send the writer with this inspector. To the best of the writer's knowledge, Dr. Porter's proposed plan never materialized. However, at the request of Dr. Howard, the writer made a visit to Bamboo Key in January and again in October and the following is a report on the mosquito conditions existing there.

About the middle of January, Dr. Raymond Turck, then State Health Officer, visited Miami and called on the writer. Dr. Turck extended an invitation to accompany him to Bamboo Key relative to ascertaining as much as possible concerning the mosquito situation there.

In July, 1923, Dr. Howard received another letter regarding Bamboo Key from a Mr. S. C. Singleton of Miami, Florida. He wrote as follows regarding Bamboo Key:

> "There is a small island called Bamboo Key, about a half mile north of Key Vaca, and about midway of its length, that is immune from mosquitoes. I am aware of the fact that this will sound a bit like a crank story, but if you wish, what I say can be supported by affidavits from others. I took up a homestead on Ramrod Key; I am not talking hearsay. If what I say is so, then few matters are better worth your attention.
>
> "Right now, when from here to Key West, the mosquitoes are plain hell, and they swarm in the cockpit and cabin of your boat, you can anchor close to this island and they will leave your boat and you can be out on the sand in your bathing suit, in comfort.
>
> "Once when sheep were pastured there, the immunity disappeared. Some time after the sheep were taken away, the Key again became immune. This is the reason why I think it is a problem coming under the jurisdiction of the Bureau of Plant Industry.

[1] Bureau of Entomology, U. S. D. A.

"If it is a plant that can be propagated, then oil or gold deposits would not add as much to the wealth of this State as the application of the knowledge of this fact. I am not able to undertake a proper investigation, I would be very glad to give you every aid within my power. It is not a matter of especial bleakness. Mangrove grows along this shore. Mosquitoes are not in this mangrove. The condition has been known to exist for at least twenty years. I trust you will investigate."

Topography of Bamboo Key, Florida

Bamboo Key, Florida is a small island about three acres in area, situated among the lower Florida Keys, approximately a half mile north of Key Vaca and about midway its length. No elevations occur, the highest point being about a foot above the water's edge. The south, east and west shore are quite rocky consisting of coral for the most part. The north shore is not as rocky and a little sand beach is to be found. For the most part the Key is of a shell and coral formation. Low depressions and swampy places do not exist about the key to effect breeding places for mosquitoes except for a few small crab holes along the shore. The writer was unable to find brackish or fresh water existing on any portion of the key during either visit there and conditions about the key were dry.

Flora of Bamboo Key, Florida

For the most part the key is devoid of trees. The few trees that do occur are close to the water's edge, and are situated on the east and south shore, while the remainder of the key is overgrown with low growing plants and shrubs of various kinds. The trees are mainly the white mangrove or button wood *Laguncularia racemosa* (L) Gaertn. and the red mangrove, *Rhizophora mangle* L. One or two Geiger trees, *Sebestin Sebestina* L. occur and a single coconut stands on the southwest portion of the Key. The writer was told Bamboo Key was a bird roost at one time, and if so, there apparently were more trees on the key than exist now. From reports the key was cleared and cultivated a number of years ago and parties resided there. The dwelling, however, was apparently destroyed by fire as parts of the foundation still remain. Due to the fact that this key was at one time cleared and cultivated apparently accounts for the lack of more trees, and mangrove occurring along the shore no doubt springing up after the key was abandoned.

During the second visit to Bamboo Key the writer had the use of a boat generously furnished by Mr. Hugh Matheson who owns

Lignum Vitae Key and also a large portion of Upper Matecombe Key where he operates a lime plantation. Captain L. Cochron, Mr. Matheson's superintendent on Upper Matecombe Key, took the writer to Bamboo Key. Capt. Cochron who has lived on the Florida Keys for a number of years, stated after the survey of the Key that he did not see a single plant growing there that does not occur on Upper Matecombe Key or some of the other keys. The writer made a careful collection of all plants growing on the Key which have been determined by Dr. John Small of the New York Botanical Garden. The determinations for record are as follows: *Aloe* sp.; *Gayoides crispum* L.; *Cyperus brunneus* SW.; *Rondia aculeata* L.; *Spartina junciformis* E&G; *Galactia spiciformis* T&G; *Dolichus minimus; Atriplex cristata* H&K; *Heliotropium curassavicum* L. *Suriana maritima* L.; Wild asparagus; *Chamaesycebuxifolia* Lam.; *Rivina humilis* L.; *Melanthera testator; Heliotropium parviflorum* L.; *Salicornia amb'gua* M.; *Laguncularia racemosa* L.; *Monanthochloe littoralis* E.; *Waltheria americana* L.; *Distichlis spictata; Dondia linearis* M.; *Lyolina clostus; Gyssipum lersutvm* and *Rliloxerus vermicularis*. From the data contained in Dr. Small's volume on the flora of the Florida Keys it appears that all the plants collected are also growing on other Florida Keys. The writer has also observed many of them growing on Grassy Key, Long Key, Lignum Vitae, Key West and Upper Matecombe Key.

Mosquito Condition on Bamboo Key

Col. Raymond Turck and the writer did not find any mosquitoes on Bamboo Key during January 1923. January is not the month to find mosquitoes there, in fact, anywhere in southern Florida. On the writer's second visit to the Key in company with Capt. L. Cochron, many specimens of *Aedes taeniorhynchus* the brackish water mosquito were collected and they were quite easily found. Mosquitoes were not present on the boat while approaching the key from the north, but the minute we reached shore by means of a small boat carried with us, we were attacked. The writer's first impression on landing was not in the least encouraging, as reports led him to believe; that is, he would possibly find a solution for combatting the brackish water mosquito in Florida. He was not, however, greatly surprised when he did find plenty of mosquitoes there. The writer surveyed the entire key and stirred up mosquitoes wherever he

went. In the mangrove the mosquitoes were quite plentiful, and in walking through the grass and shrubs, mosquitoes were encountered. It is the writer's belief that mosquitoes do not occur on Bamboo Key in as large numbers as on Key Vaca or Grassy Key as well as some of the other keys in the vicinity. Bamboo Key is more or less wind swept. The vegetation is not so thick or as high and does not afford the harboring conditions for mosquitoes as the other keys which are covered with mangrove and high growing shrubs. Then again mosquitoes were not found breeding on the key as they were on the other neighboring keys. It appears that the mosquitoes occurring on the Key migrated there from adjoining keys to the south or southeast the prevailing winds aiding their migration from that direction. Bamboo Key might have been free from mosquitoes at one time but this is not true at present. It may be the key is comparatively free from mosquitoes during short periods even during the time mosquitoes are plentiful on some of the other keys if the weather conditions are favorable and the wind is in a direction unfavorable for their migration to Bamboo Key.

THE QUARTERLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

WILMON NEWELL, *Plant Commissioner*..*Editor*

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E. W. BERGER..*Entomologist*
J. C. GOODWIN..*Nursery Inspector*
J. H. MONTGOMERY..*Quarantine Inspector*
O. F. BURGER..*Plant Pathologist*

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

DEPARTMENT OF CITRUS CANKER ERADICATION

REPORT ON ERADICATION WORK IN COOPERATION WITH THE BUREAU OF PLANT INDUSTRY, UNITED STATES DEPARTMENT OF AGRICULTURE, FOR QUARTER ENDING SEPTEMBER 30, 1926

Citrus grove trees inspected	2,540,884
Citrus nursery trees inspected	28,388,369
Inspectors employed on citrus canker eradication	27
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

GENERAL SUMMARY

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15,156
Nursery trees found infected since May, 1914	342,260
Number properties found infected to September 30, 1926	512
Properties declared no longer "danger centers"	512*
Properties still classed as actively infected September 30, 1926	0

*Two of the formerly actively infected properties are still resting under certain restrictions, which apply direct to these properties but do not affect adjoining or contiguous properties. These restrictions refer to methods of cultivation, etc.

Department of Citrus Canker Eradication (Report Continued)

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to Sept. 30, 1926:

1914		1915		1916		1917		1918		1919		1920		1921		1922		1923		1924		1925		1926	
Jan.		Jan.	806	Jan.	86	Jan.	14	Jan.	0	Jan.	0	Jan.	0	Jan.	0	Jan.	0	Jan.	1	Jan.	0	Jan.	0	Jan.	0
Feb.		Feb.	165	Feb.	21	Feb.	4	Feb.	1	Feb.	0	Feb.	0	Feb.	0	Feb.	0	Feb.	1	Feb.	0	Feb.	0	Feb	0
Mar.		Mar.	444	Mar.	49	Mar.	9	Mar.	1	Mar.	1	Mar.	0	Mar.	0	Mar.	0	Mar.	2	Mar.	0	Mar.	5	Mar.	0
Apr.		Apr.	408	Apr.	49	Apr.	169	Apr.	2	Apr.	1	Apr.	0	Apr.	0	Apr.	0	Apr.	3	Apr.	0	Apr.	0	Apr	0
May	108	May	1042	May	338	May	52	May	1	May	1	May	0	May	0	May	585	May	2	May	0	May	0	May	0
Jun.	160	Jun.	772	Jun.	450	Jun.	45	Jun.	10	Jun.	0	Jun.	0	Jun.	0	Jun.	168	Jun.	1	Jun.	0	Jun.	0	June	0
Jul.	276	Jul.	651	Jul.	349	Jul.	39	Jul.	0	Jul.	0	Jul.	539	July	0	Jul.	28	Jul.	0	Jul.	0	Jul	0	July	0
Aug.	1313	Aug.	1345	Aug.	219	Aug.	30	Aug.	0	Aug.	1	Aug.	1	Aug.	0	Aug.	34	Aug.	0	Aug	0	Aug	0	Aug	0
Sep.	767	Sep.	618	Sep.	124	Sep.	6	Sep.	0	Sep.	0	Sep.	0	Sep.	0	Sep.	23	Sep.	0	Sept.	0	Sep	0	Sept	0
Oct.	565	Oct.	214	Oct.	451	Oct.	2	Oct.	0	Oct.	0	Oct.	0	Oct.	0	Oct.	19	Oct.	1	Oct.	0	Oct.	0		
Nov.	778	Nov.	494	Nov.	131	Nov.	1	Nov.	0	Nov.	0	Nov.	0	Nov.	0	Nov.	12	Nov.	0	Nov	0	Nov.	0		
Dec.	366	Dec.	256	Dec.	27	Dec.	1	Dec.	0	Dec.	0	Dec.	0	Dec.	0	Dec.	4	Dec.	0	Dec.	0	Dec.	0		
Total	4327	Total	6715	Total	2294	Total	372	Total	15	Total	4	Total	540	Total	0	Total	873	Total	11	Total	0	Total	5		

QUARANTINE DEPARTMENT

Quarantine Inspector's Quarterly Summary
Quarter Ending September 30, 1926

Ships and Vessels Ispected:			
From Foreign Ports—			
Direct	535		
Via U. S. Ports	102		
Total		637	
From U. S. Ports other than Florida		572	
From Florida Ports		172	
Total			1,381
Number of Parcels Inspected:			
Arriving by water:			
Passed		139,653	
Treated and passed		272,002	
Returned to shipper		714	
Contraband destroyed		345	
Total			412,714
Arriving by Land—Express, Freight, Wagon, etc.:			
Passed		5,469	
Treated and passed		361	
Returned to shipper		759	
Contraband destroyed		398	
Total			6,987
Arriving by Mail:			
Passed		117	
Treated and passed		7	
Returned to shipper		7	
Contraband destroyed		16	
Total			147
Grand Total of Parcels Inspected			419,848
Number of parcels on hand pending determination as to final disposition		21	

BEE DISEASE ERADICATION

Report for Quarter Ending September 30, 1926

Number of apiaries inspected	165
Number of colonies inspected	4,916
Number of apiaries infected with American foul brood	1
Number of colonies infected with American foul brood	19
Number of apiaries infected with European foul brood	0
Number of colonies infected with European foul brood	0

THE QUARTERLY BULLETIN

State Plant Board of Florida

Vol. XI January, 1927 No 2

LETTER OF TRANSMITTAL

December 13, 1926.

To His Excellency,
John W. Martin,
Governor of Florida.

SIR: Herewith is submitted the report of the State Plant Board of Florida for the biennium ending June 30, 1926. Please submit same to the Legislature.

Respectfully,
STATE PLANT BOARD OF FLORIDA,
By P. K. YONGE,
Chairman.

REPORT OF STATE PLANT BOARD

The continuance of the work of carrying out the provisions of the Plant Act of 1915 has been along the same broad general lines as in former years. The application of the law and of the rules and regulations passed by the Board has been entrusted to the Plant Commissioner as chief executive officer of the Board. Under the Commissioner the activities are directed by the several department heads or by specialists in charge of certain projects. The departments are: Grove Inspection (Citrus Canker Eradication), Nursery Inspection, Quarantine, Entomology, Pathology and Apiary Inspection (Bee Disease Eradication).

The Board is pleased to report that the organization has functioned efficiently and with profit to the state. Without question the spread of plant pests has been curbed and the introduction of new pests from without the state has been prevented. In its activities the Board has had splendid cooperation from all organizations concerned in work of a similar nature or whose activities in any way touch those in which we are engaged. The United States Department of Agriculture, through the Bureau of Plant Industry, has continued to support the citrus canker eradication campaign. The Bureau of Entomology has also aided in numerous ways, while the Federal Horticultural Board has engaged

with us in the effort to exclude foreign plant pests. The Florida Agricultural Experiment Station, the College of Agriculture, and other integral parts of the University have unfailingly responded to the Board's request for assistance. In partial return for these courtesies, the Board rendered help and advised with cooperating organizations. The relations with other state regulatory bodies have been mutually helpful and cordial.

The Board submits as a part of its report the Biennial Report of the Plant Commissioner and the financial statement of the Board's Secretary. The Board would direct attention to the Plant Commissioner's report in that it is of a somewhat unusual nature. The Commissioner's report in its first section indicates not only wherein the organization has performed efficiently but indulges in some very constructive, although frank, criticism. The Commissioner points out weak places in our defensive warfare against plant pests and suggests ways in which they may be strengthened. The Board concurs in the Commissioner's comments and commends to serious consideration the Commissioner's recommendations for betterment of the service.

The detailed information with respect to the general and special activities of the Board may be obtained by reference to the Report of the Plant Commissioner. There are certain matters, however, with which the Board has been directly and immediately connected and to which attention should be directed. Perhaps the most important of these is that of legislation. In the Commissioner's report is told the situation arising from a decision of the United States Supreme Court which placed an entirely new construction on the rights of states to impose plant quarantine regulations. In effect this decision was that by reason of the Federal Plant Quarantine Act of 1912 all such quarantine measures must be imposed by the Secretary of Agriculture of the Federal Government. The decision swept away all state rights in plant quarantine which it was thought the states possessed. A critical situation was thus presented, which was met by Congress taking emergency action and passing legislation amending the Act of 1912 in such manner as to remedy the difficulty. A secondary effect is that expert legal opinion seems to hold that state legislation enacted subsequent to the Federal Act of 1912 is null and void. In this class would fall our own Plant Act of 1915. In the opinion of the Board it may be desirable, at the next session of the legislature, to so amend the present Plant Act

as to remove any conflict between the Federal Law and the State Law.

The Board has from time to time authorized attendance by representatives at various conferences, hearings and meetings at points outside the State. These have always been of sufficient importance as plant quarantine subjects to justify the expense. Notable among such have been hearings at Washington bearing upon both foreign and interstate plant quarantines; also the situation resulting from the court decision previously referred to. In the latter Florida played no small part in the framing of and passage of the necessary remedial legislation.

The Board reports that during the biennium sums were released from the Emergency Fund for two projects by joint action of the Board and the Governor: (a) For prosecution of investigations in re coconut bud rot; (b) for citrus aphis investigations. The circumstances in connection with each are as follows, as abstracted from the minutes of the Board:

Coconut Bud Rot

October 13, 1924.—The Plant Commissioner recommended that the inspectional work in the coconut bud rot infected territory on the lower east coast be increased very largely, but stated that unless funds could be secured from the Emergency Appropriation he did not see how the work could be continued. The Board agreed to present the request to the Governor on the 10th of November and in the meantime the Plant Commissioner was instructed to secure all the available information possible regarding the coconut bud rot disease in Florida and have it ready for the consideration of the Board and the Governor at the conference on the 10th of November.

November 10, 1924.—The Board met in conference with the Governor on November 10 to consider the coconut bud rot disease situation on the lower east coast. After discussing the matter at length, Mr. Davis moved that an emergency be declared to exist necessitating the use of $10,000 of the appropriation made under Section 2, General Appropriation Bill, Acts of 1923, between now and July 1, 1925, for the purpose of investigating the disease known as coconut bud rot on the lower east coast of Florida. The Governor requested the Chairman to put the motion. The motion was put and carried unanimously. The Governor stated that he would consider the above action as a recommendation coming to him from the Plant Board for the release of $10,000 of the appropriation mentioned above for the purpose as stated in the motion just voted upon and informed the Plant Board that he would approve the recommendation.

(The 1925 appropriation bill provided funds for the continuance of this work after July 1, 1925.)

Citrus Aphis Investigations

February 16, 1925.—A special meeting of the Board was called at Tallahassee on February 16, 1925, for the purpose of holding a joint session with the Governor to consider the advisability of determining that an emergency exists in the citrus growing section of the state on account of the presence of a serious pest known as the citrus aphis, necessitating the use of funds appropriated under Section 2, General Appropriation Bill, Acts of 1923, to be used by the Plant Board in the discovery of the best methods for the

control of this insect. The Governor stated that he had requested a meeting of the State Plant Board upon the request of several citrus growers who were anxious to have funds from the Emergency Appropriation released in order that the Plant Board might discover more effective methods of controlling the citrus aphis in the citrus growing section of the state. The Governor and the Plant Board determined that an emergency existed necessitating the use of $10,000 of the appropriation made under Section 2, General Appropriation Bill, Acts of 1923, to be used for the purpose of research work in an effort to discover more effective methods of controlling the citrus aphis. The Governor then stated that he approved of setting aside $10,000 of the Emergency Fund for investigating the citrus aphis. The Secretary of the Board was instructed to notify the State Comptroller of this action of the Governor and to request him to place the $10,000 as requested to the credit of the Plant Board to be used for the purpose stated. He was also instructed to notify the Plant Commissioner to proceed with the work at the earliest possible date.

July 11, 1925.—The Plant Commissioner requested an expression from the Board as to its attitude regarding the continuance of the citrus aphis investigational work. The Chairman and the Plant Commissioner were requested to take up the matter with the Governor and see what could be done regarding the release of some of the Emergency Appropriation to carry on this investigational work. The Plant Commissioner was instructed to do his best to continue the work until after the next meeting of the Board.

August 10, 1925.—The legislature having failed to make any appropriation for the citrus aphis investigational work, a set of resolutions was adopted by the Board in re funds to be made available from the State Plant Board Emergency Fund for use of the State Plant Board, in cooperation with the Agricultural Experiment Station, for continuing the investigations previously undertaken. A copy of the resolutions was forwarded to the Governor with the request that he approve the expenditure of $10,000 for the purpose of these investigations. The Governor did so.

The Board has, during the biennium, passed, revised or repealed rules, regulations and public notices as follows:

Rules and Public Notices

1924

September

(1) Rule 11F adopted.
(Prohibiting shipment of citrus fruits originating in Cuba into State of Florida for delivery therein, on account of Mediterranean fruit fly, West Indian fruit fly, etc.)

October

(1) Public Notice declaring certain areas in Florida to be infected with scaly bark amended, so as to include new areas in Lake, Orange and Putnam Counties.

November

(1) Rule 49 adopted.
(Prohibiting the importation into Florida of tung-oil stock and seed in order to prevent the introduction of injurious insects and diseases affecting tung-oil trees.)

(2) Public Notice declaring certain areas in Florida to be infected with the mosaic disease of sugar cane amended to include the Counties of Baker, Duval, Columbia, Hamilton, Nassau, Suwanee and Taylor.

(3) Rule 6, re scaly bark certificate.
(The Board rescinded its action of April 14, 1924, amending Rule 6, so that in the future the form of the scaly bark certificate tag will read as it did under the action of the Board on April 9, 1922.)

December

(1) Public Notice declaring certain areas in Florida to be infected with the mosaic disease of sugar cane amended to include the Counties of Alachua, Bradford and Union.

1925

March

(1) Public Notice declaring certain areas in the State to be infected with scaly bark amended so as to include Sections 10, 11 and 15, Twp. 34 S., R. 35 E., Okeechobee County.

June

(1) Rule 15, re scaly bark, repealed.

(2) Rules 15A and 15B adopted.
(Providing for more drastic requirements as preliminary to certification of nursery stock produced in localities where scaly bark occurs.)

(3) Public Notice declaring certain areas to be infected with the disease known as scaly bark amended by striking out detailed description of infected area, substituting therefor the names of the counties in which the disease occurs.

(4) Rule 6 amended.
(Eliminating from the rule that portion prescribing the form of certificate tag to be made use of in connection with shipments of citrus nursery stock originating in scaly bark areas.)

September

(1) Public Notice declaring certain areas in other states to be infested by the sweet potato weevil amended to include Baldwin County, Alabama.

October

(1) Rule 41 amended.
(Permitting importation of sugar cane from other states and foreign countries into sections of Florida known to be infected by the mosaic disease of sugar cane.)

(2) Rule 48 amended.
(Applying also to shipments of green beans, peas, etc., from areas in other states which may at some future time become infested with the Mexican bean beetle.)

1926

March

(1) Rule 4C, requiring the covering of nursery stock while in transit, was repealed.

(2) Rule 4E amended.
(Permitting the scrubbing of host plants of San Jose scale in lieu of fumigation.)

(3) Rule 4I amended.
(Eliminating the covering requirement from first paragraph; by permitting scrubbing of host plants of San Jose scale in lieu of fumigation; by eliminating the requirement regarding scrubbing of host plants of cottony cushion-scale; by making the wording in the fifth paragraph uniform; and by changing the expiration date in the permit certificate to conform to the wording of the permit certificate in Rule 6.)

(4) Rule 4J was repealed, for the reason that the provisions of this rule are now included under other rules.

(5) Rule 4K amended.
(By substituting the words "fish oil soap" for "whale oil soap", and by changing the prescribed strength of the solution to be used in scrubbing nursery stock.)

June

(1) Rule 4 amended.
(By eliminating "banana plants" from the definition of nursery stock; and by striking out the second sentence of the rule, providing for the use of a permit tag issued by state of destination on shipments of nursery stock consigned to points outside of Florida, in lieu of a Florida certificate tag.)

(2) Rule 4G amended.
(Eliminating the words, "provided, however, that banana plants and banana bulbs shall be considered as being nursery stock.")

(3) Public Notice declaring certain insects and diseases to be public nuisances amended by the elimination of "Banana Root Borer" and "Panama Wilt of Banana" therefrom.

(4) Rule 4A amended.
(Adding "Banana Root Borer" and "Banana Wilt Disease" to the list of especially injurious insect pests and diseases.)

The official actions of the Board in connection with regulations have been given publicity through the issuance of the Board's "Circulars", through the "Quarantine Notices" issued from the Quarantine Department, and also through the utilization of the News Service of the Agricultural Experiment Station. The Board has continued to publish the "Quarterly Bulletin", containing articles on subjects pertaining to plant pest control, departmental reports, Board rules, etc.

The personnel of the Board at the end of the biennium is as follows: P. K. Yonge, E. L. Wartmann, A. H. Blanding, W. B. Davis and E. W. Lane. Messrs. Wartmann and Blanding had been appointed as members of the Board by Governor Hardee in July, 1923. Dr. Yonge was reappointed to succeed himself and Mr. Lane to succeed Mr. J. C. Cooper, Jr., in August, 1925. Mr. Davis, who filled out the unexpired term of Mr. W. L. Weaver, was reappointed by Governor Martin on November 13, 1925. The present Board was organized August 10, 1925, with P. K. Yonge as Chairman and J. T. Diamond as Secretary.

The reports of the Plant Commissioner and the Secretary are transmitted herewith.

STATE PLANT BOARD,
P. K. YONGE,
Chairman.

REPORT OF THE PLANT COMMISSIONER

For the Biennium Ending June 30, 1926

Gainesville, Florida, November 15. 1926.

Honorable P. K. Yonge, Chairman,
State Plant Board of Florida.

SIR: I have the honor to present herewith my report as Plant Commissioner for the biennium ending June 30, 1926.

Respectfully,
WILMON NEWELL,
Plant Commissioner.

SECTION I

The Plant Commissioner presents herewith his report for the biennium ending June 30, 1926. This report differs somewhat from the usual stereotyped official report, in that the statistical matter is to a large extent eliminated and much material as to the routine activities is not included. At this point it may be well to quote from the last biennial report as follows:

"Former reports have been somewhat detailed and elaborate. Now that the Board has been functioning for almost ten years, its work has become systematized and the public is well advised as to the nature of the Board's work, it is not thought necessary or advisable to submit a report dealing with the work in such detailed manner as formerly. The Board members are cognizant of the manner in which the Plant Commissioner and the department heads have handled the particular phases of Plant Board work assigned to them. The members of the State Legislature and the public generally, by reason of the extensive and rather voluminous reports heretofore submitted, have been kept advised as to the efforts made by the Board to protect the state's horticultural and agricultural industries. This report will therefore deal especially with the more important aspects of our work during the biennium closing June 30, 1924. In the compilation of the statistical matter here presented, an immense amount of detailed information has been condensed. This is particularly true with respect to the data included in the section devoted to the activities of the Nursery Inspection Department."

What was said two years ago applies with equal or greater force now. In still another and more marked respect this present report will be different. The Plant Commissioner proposes to indulge in extended comment not only upon the efficiency but upon the inadequacy of the work of the Board which is under his direction and to offer to the Board certain recommendations with respect to the manner in which the weak places may be strengthened.

Much of the subject matter in this report was included in a carefully prepared address delivered by the Plant Commissioner before the State Horticultural Society at Cocoa in April of this year.

Ten years ago the citrus growers of Florida were engaged in a life and death battle with citrus canker. That enemy has apparently been successfully combated—has been defeated for the time being at least. The immediate menace to the citrus industry from that source has been averted. The horticulturists of the state seem satisfied to rest content in this belief, thinking that the canker danger is a thing of the past and that no other dangers threaten. They are deluding themselves.

Many changes have taken place in Florida in ten years and many of these changes have created new conditions for the horticultural industries and have brought new dangers. Some of these we propose to bring to your attention.

The Quarantine Situation

The Plant Board's quarantine work was commenced in 1916 and by 1917 was regarded as quite fully meeting the needs of the situation. Quarantine inspectors were located at all ports of entry, including Miami, Key West, Jacksonville, Tampa and Pensacola and, with the volume of traffic moving at that time, these men were able to inspect not only all horticultural materials arriving by boat, but also all freight and express shipments of plants and plant products and the hand baggage of passengers arriving by rail at these points. By 1918 a fairly high degree of cooperation had been perfected with the postmasters of the state, whereby uninspected plant material arriving by mail from outside the state was submitted to Plant Board representatives for inspection.

Let us contrast the situation then with that of today. All of the ports mentioned have become maritime shipping points with

a heavy foreign commerce and greatly increased coastwise commerce. At all of these places the pressure of work on the inspectors has required the partial abandonment of inspection of parcel post shipments and of railway freight and express shipments. Vessels from foreign countries, and particularly from the tropics, present the greatest menace, hence all other quarantine work has been curtailed in order that this greatest menace may receive attention. Even the foreign commerce alone is now taxing our quarantine force to its utmost.

During the fiscal year 1916-17, 1,240 foreign vessels arrived at Florida ports; during the last fiscal year there arrived 2,437. Coastwise vessels arriving in 1916-17 numbered 2,017; in the last year 3,027. During 1916-17, 3,105 shipments (both water and rail) were inspected; while in 1924-25 the parcel (or container) inspections numbered 1,633,015. Out of the latter number, 3,040 were found to contain dangerous pests and were destroyed, while 2,630 more were returned to the shippers as being unsafe for delivery in Florida.

What has this quarantine service meant in the way of protection to our industries? Since it was established, the Plant Board inspectors have intercepted, in shipments coming into Florida—or trying to come in—the blackfly 48 times, the West Indian fruit fly 24 times, the pink bollworm of cotton three times, the Mexican orange maggot twice and the Mediterranean fruit fly once.

And this is not all. The Plant Board inspectors have intercepted much infested material coming to us from other states. The Argentine ant, the gipsy moth and the yam weevil have all been "caught" in rail, express and mail shipments, while the intercepted shipments infested with less serious insects and diseases have run into the thousands.

Increase in the Plant Board's funds for quarantine work has by no means kept pace with the tremendous increase in volume of commerce coming into Florida. In 1916-17 the Board expended $25,835 in its quarantine work; in the present fiscal year the Board has but $44,310 with which to try to meet the situation!

Of the pests intercepted, the Mediterranean fruit fly is the dean of them all and the terror of horticulturists throughout the world. Florida is not directly exposed to infestation by this insect but that means very little, for infested fruit has been inter-

cepted. The fruit that was found infested with the Mediterranean fruit fly, in this instance, came from Spain by way of Cuba and was in a ship's stores. This experience only emphasizes the fact that Florida is in danger of receiving any pest occurring anywhere on the globe and the price of future freedom from these threatening calamities is eternal and efficient vigilance. We wish to emphasize the word "efficient". Even though the individual Plant Board inspectors may be ever so efficient and industrious and hard-working, there is a limit to human endurance and to the amount of physical work one can do in a day or a week or a year. When the number of vessels arriving passes beyond a certain point the available inspectors cannot get to all of them and the uninspected vessel or shipment may be the very one that brings the long-feared pest that will cost the state millions of dollars. A fence is useless if it is down and broken in many places.

The number of inspectors that the Plant Board can employ is limited by the amount of appropriation available for this work. We have already stated that the pressure of foreign commerce at our ports has compelled the partial abandonment of inspection of coastwise vessels and of freight and parcel post shipments. A still further increase in foreign commerce at Florida ports will bring a break-down of our quarantine against pests from foreign countries, as our domestic quarantines have already broken down under the great increase in the state's commerce.

Parcel Post Shipments

Under an Act of Congress of March 4, 1915, the states may make arrangements whereby parcel post shipments of plants entering the state may be inspected by the state officials. Arrangements were made for such inspections in 1916 and for a few years, through rather good cooperation on the part of postmasters, a large quantity of material was examined. During the year 1917-18, for example, the inspectors examined 5,045 parcels, of which 266 were found non-deliverable because of insects or diseases. Experience in making these inspections showed that mail shipments are accompanied by many and diverse dangers.

But what has happened? The Plant Board has never had any specific provision in its budget for this work. It has had to provide for it out of the funds available for quarantine work. As

the latter work has increased at the ports and as it has become increasingly necessary to concentrate on the foreign shipments, less and less time and money have been available for the parcel post inspections. The cooperation of postmasters in selecting out the mail shipments of plants and diverting them to the inspection stations can be maintained only by personal contact with the postmasters themselves and it has simply been impossible to maintain this contact. During the past fiscal year, only 2,838 parcel post packages were submitted by the postmasters for our inspection.

On top of all this, the post offices have themselves been swamped with mail matter far beyond their capacities, it has required the utmost effort on the part of their clerks to handle the mails at all and under such circumstances they could hardly be expected to watch for a certain type of mail packages and hold it out for our inspection.

Shipment of plants by parcel post has increased tremendously, the volume of movement through this channel probably now being comparable with the volume of express shipments. The parcel post presents a most grave danger to Florida horticulture, but the Plant Board finds itself helpless to cope with the situation. *This* door is practically wide open for our enemies.

Rail Movement

A few years ago the great bulk of freight and express came into Florida through Jacksonville and Pensacola. At present it is coming in through several other gateways and new lines of railway are being constructed which will still further increase the points of entrance. It is even now impossible for Plant Board inspectors to be stationed at all the junction points where shipments of nursery stock and other suspicious material enter the state.

This difficulty can be met in only one way and that is by the state requiring all shipments of plants and plant products, destined for Florida points, to be sent into the state through certain designated entry stations where they will be inspected. This, of course, requires funds for the establishment and maintenance of these inspection stations and their personnel.

Automobiles and Good Roads

The perfection of motor vehicles and the construction of thousands of miles of paved roads has been a wonderful factor in the

development of Florida but these things have, at the same time, provided a means for the rapid distribution of insects and plant diseases such as the world has never before witnessed.

A few years ago, the state could be quite well safeguarded by imposing and enforcing regulations governing the movement of plants by rail, water and express. Now, the movement by automobile and truck probably exceeds that by rail. Examples of this new danger are all around us. Trucks loaded with oranges and grapefruit go from Florida to adjacent states and return with loads of sweet potatoes infested with the sweet potato weevil. Thousands of automobiles, coming through Georgia and Alabama, gather up stalks of mosaic-infected sugar cane and they even reach the heart of the future sugar area of the Everglades before they have used or discarded the last of it. Estimable Florida citizens, when desiring to bring in citrus trees from other states without being interfered with by the Plant Board regulations, merely drive a truck or auto into adjoining states and get them. Tourist automobiles driven through the heart of the Japanese beetle territory of New Jersey and Pennsylvania in midsummer when the beetles are flying in swarms, are in the State of Florida within four or five days thereafter.

There are nearly five hundred miles of northern boundary line, crossed by hundreds of roads, and it would require an army of men to police it.

Within the state, there is now a greater movement of uninspected nursery stock than ever before. It is being moved in automobiles and trucks, up and down the roads, everywhere. The amount of uninspected citrus being moved in this way is of such great volume as to raise a serious question as to whether it would be possible to stamp out or control citrus canker should the disease break out in more than a very small area. Coconut palms uninspected and taken from nurseries under quarantine on account of coconut bud rot, have been moved from the lower East Coast to the central part of the state and to the lower West Coast. In fact, with the opening of additional cross-state highways the West Coast is in a fair way to receive all pests and diseases of the East Coast and vice versa—and we can assure you that each of these sections now has a number of important pests not common to the other.

California's experience has shown the menace attaching to automobile traffic. However, Nature has provided California

with a wonderful opportunity for protecting herself, in that there are but few automobile gateways to California. That state does maintain inspection stations at these gateways and every entering automobile is stopped and searched. Out of 84,000 such automobiles inspected, the California inspectors apprehended 500 infested lots of materials!

We have no such gateways to make use of, but unless this wholesale, unregulated movement of plants into and about the state is curbed, the Plant Board's efforts to protect our horticultural industries must become unavailing.

A continuation of this condition will mean that Florida will, sooner or later, get citrus canker, the brown rot of citrus fruits, the Japanese beetle and its equally destructive cousin, *Anomala orientalis*, the Mexican bean beetle, gipsy moth, camphor scale and Argentine ant. It also means that we may expect to see, within a very few years, the sweet potato weevil and the mosaic disease of sugar cane universally distributed throughout the state.

In our opinion there is but one answer to this particular problem and that is the maintenance of motorcycle officers or inspectors, on the public roads, whose special business it is to investigate every motor vehicle carrying plants, fruits, trees or vegetables and to give proper attention to dangerous material. We cannot expect county and city traffic officers to attend to this duty for us: they are interested primarily in getting fees and even were they so minded, they could not perform the duties of "plant policemen" for they lack the necessary technical knowledge. The Plant Board cannot at present place mounted inspectors on the roads: its inspectors do not have authority to make arrests or to collect bond for the offenders' appearance in court and without these weapons the inspectors would be helpless. Likewise the Board has no funds available for supporting this work, even if the legal authority could be found.

Citrus Canker

The conditions we have recited show how easy it has become for citrus canker to again invade the state. It is also true that the skeleton force of about twenty-five grove inspectors which the Board now maintains in the groves of the state, can, by the most hasty methods of scout inspection, get over the grove acreage in Florida only once in about four years. What an oppor-

tunity is afforded for a little incipient canker infection to become a wide-spread conflagration before it is detected! Our experience with the citrus canker outbreaks which have occurred in the past six years has conclusively shown that the cost of maintaining a larger grove inspection force would be more than met by the reduced cost of stamping out canker infections, on account of these being discovered before they assume large proportions. In some instances it has cost more than $50,000 to stamp out a single outbreak. How much more sensible would it be to provide a larger inspection force and catch the infections in their incipiency, thereby saving not only the taxpayers' money but averting heavy losses to the owners of the infected groves?

The Nursery Problem

It must not be forgotten, in considering these matters, that the horticultural nursery can be just as efficient a propagator and distributor of insects and diseases as it is of trees and plants. All measures of pest prevention must largely fail of their object if the nurseries become infested and distribute these same pests with the nursery stock. No state can in any sense consider its horticulture protected unless it maintains a highly efficient nursery inspection service.

The nursery inspection work of the State Plant Board has been, we believe, the most efficient of its kind in the United States but, even so, it is not sufficient to meet the needs of Florida.

The nursery acreage in the state has doubled in the last three years. In 1923 there were 4,698 acres in nursery stock and in 1925 there were 9,407 acres; the latter containing 68,-266,000 trees and plants. To inspect these sixty-eight million trees and plants, the Plant Board has but twelve field inspectors. The average number of inspections per nursery a year is now 2.6. Not less than four inspections a year are necessary for a relatively high degree of safety.

Expansion and concentration on the three major activities of the Board appears to be the logical method of handling the situation depicted. Nursery inspection should be so organized as to permit of four thorough inspections being made of all nurseries

each year, the grove inspection force should be of such a size as to make an inspection of all citrus trees in the state each year, and the port quarantine inspection service should be strengthened so that all dangerous or potentially dangerous horticultural material will either be barred or enter under supervision.

We do not mean by this that what might be termed the collateral activities of the organization should be neglected. It is necessary to the proper functioning of the organization that certain scientific work be carried on, as, for instance, the work of the pathological and entomological divisions must be maintained for the double purpose of identifying plant pests and of seeking new information as to methods of control, suppression or elimination of plant pests. A striking example of the necessity for this kind of activity lies in the surprising lack of information on the subject of fumigation of trees and plants, especially under Florida conditions.

It is with these various facts in mind that we are submitting, as a portion of this report, estimates of the funds believed to be necessary to meet our pressing requirements. The Plant Commissioner and his staff have given great care to the preparation of these estimates. We present them to the Board as representing our best judgment and as being the absolute minimum required to afford protection to our horticultural industries. Large as the total may seem, yet it is small in comparison with other figures which might be made use of in showing the annual toll which the producer pays in combating, by means of sprays and other methods, the pests which attack our orchards and fields. Unfortunately, we do not have available accurate statistics covering this cost in Florida. Our sister state of California has, through her superior facilities, collected reliable data on this subject. It is shown that in considering the California citrus crop of 1924 a valuation of forty million dollars was placed upon the crop. The amount expended by growers for the purchase and application of spray materials and of fumigants was four and a half million dollars. It is also stated that the direct loss from plant pests to the California citrus crop of 1924 was four million dollars, thus making a total of eight and a half million dollars, or about twenty per cent of the crop value. It would probably be safe to say that the Florida producer of citrus fruits alone pays an equally great toll. Contrast this figure with the total of the estimates here submitted. The conclusion is inevit-

able that what might be termed the insurance rate is low. It must be remembered also that the great bulk of the Board's resources is expended in the combination effort of excluding plant pests of major importance, such as the fruit flies, the citrus blackfly, citrus canker, etc., and of locating such of them as may, by some misfortune, evade the vigilance of our port guardians. In the latter event, that is, discovery of a new and serious pest, there would naturally be a concentration of effort to suppress. It is here that the necessity arises for having immediately available a relatively large sum of money for emergency use. It is sincerely hoped that the wise policy of past legislatures in providing an emergency fund, available through joint action of the Board and the Governor, will be continued. The Plant Commissioner ventures to recommend, however, that this emergency fund be at least $100,000.

While on the subject of having available an emergency fund, the Plant Commissioner would direct your attention to the fact that such a fund, although it has been available since July 1, 1923, has not been made use of except on two occasions. In one instance the Governor and the Board, on November 13, 1924, approved of the release of $10,000 for investigation of the situation created by the discovery of what was believed to be a very serious disease of coconuts on the lower East Coast, namely, coconut bud rot. In the second instance where the emergency fund was made use of, $10,000 was released on February 18, 1925, for the investigation of a new pest which was attacking citrus and doing enormous damage to the citrus trees; that is, the citrus aphid. Reference will be made further in this report to both of these situations.

That the Board may be informed as to the activities of the several departments of the organization, we present in following sections brief summaries giving the essential facts in regard to each, which facts we believe should be brought to the attention of the Board, the members of the State Legislature, and the public. Inasmuch as former reports have, as a rule, gone into more or less detail and as the work of the organization has become well understood and, we hope, appreciated by officials and the public, we deem it unnecessary to indulge in repetition and in the submission of much detailed information contained in former reports.

Federal-State Relations

Much of the work of the State Plant Board bears a direct relation to and connection with similar work of the Federal and other state governments. We are pleased to report that the cordial and helpful cooperative spirit which has heretofore existed has continued throughout the past two years. In times past the movement of nursery stock and horticultural products interstate has been the subject of no little friction and misunderstanding, due largely to multiplicity of regulations and lack of uniformity in requirements, as well as application. This situation is vastly improved.

The improved condition and better understanding is, in large measure, the result of the various states and the Federal Department of Agriculture being drawn closer together through contacts of officials and by organization for exchange of views and ideas pertaining to regulatory work. There has been formed a group of conference bodies which, in turn, through selected representatives, form a national organization. The state groups consist of plant quarantine officials of the several states comprising the four regional organizations, or so-called Regional Plant Quarantine Boards. With the approval of the State Plant Board, the Plant Commissioner and the department heads hold membership in the Southern Regional Board. The Plant Commissioner is one of the two representatives of the Southern Plant Quarantine Board on the National Board.

The National Board consists of two representatives from each of the four Regional Boards. This Board is, of course, unofficial but is recognized by the United States Department of Agriculture as an advisory board to act with the Federal Horticultural Board in the effort to coordinate, correlate and systematize plant quarantine activities, state, interstate and national. It is expected that much will be accomplished through the activities of these interlocking organizations.

The necessity for closer relations and better understanding between states and between the states and the Federal agencies became so evident that the Secretary of Agriculture called a conference of state and Federal officials at Washington in April of 1925. This was attended by your Plant Commissioner and Quarantine Inspector. After a two-day meeting, a formula was worked out as a "basis of agreement" between state and Federal officials. This formula, based largely on the opinions of the

legal advisers of the Department, set forth the rights of state quarantine and of Federal quarantine authorities and by so doing cleared up much misunderstanding formerly existing, especially with respect to interstate movement of material which had been the subject of Federal quarantine action. This national conference also had the effect of crystallizing in the minds of many officials the idea of organization and without doubt hastened the creation of the Regional and National Plant Quarantine Boards previously referred to.

National Legislation

In March of 1926 the Plant Commissioner's office was apprised of the fact that a decision handed down by the United States Supreme Court placed an entirely new interpretation on a portion of the Federal Plant Quarantine Act of 1912 with respect to the rights of state authorities to impose restrictions on interstate movement of plants and plant products. It had been believed that in such matters the states were at liberty to impose such restrictions as were thought necessary when the Federal authorities had not acted. The nature of the decision rendered by the nation's highest tribunal in the case referred to—i. e., The Oregon-Washington Railroad & Navigation Company vs. The State of Washington*—was such as to practically invalidate all state quarantines regulating or prohibiting movement into or through a state of plants and plant products. It was evident that the scope of this decision was far-reaching and of great moment. Under authorization of the Board, the Quarantine Inspector proceeded to Washington and there joined with Mr. Lee A. Strong, Assistant Director of Agriculture, State of California, in a series of conferences with officials of the Department of Agriculture and others as to ways and means of correcting the critical situation resulting from the court decision. Remedial legislation was drafted and presented to Congress. This proposed legislation amended the Act of 1912 so as to restore to the states the rights of which they had been deprived through the court decision. The Plant Commissioner later went to Washington and appeared before the Senate Committee on Agriculture in support of the amendment and otherwise interested himself in furthering its passage. At the regular monthly meeting of the State Plant

*——U. S.——, 70 L. Ed. (No. 187, October Term, 1925, U. S. Supreme Court.)

Board held at Gainesville on April 12, 1926, the Plant Commissioner formally reported to the Board regarding the status of Federal legislation on plant quarantines and commented as follows:

"Under date of March 29 the Plant Commissioner submitted by mail to the Board members a report covering the situation with respect to the enactment of federal legislation intended to restore to the several states certain rights and privileges with respect to handling interstate movement of plants and plant products, which rights and privileges the states had been deprived of through a decision handed down on March 1 by the United States Supreme Court. As of March 29 the remedial legislation had been passed by the United States Senate. Subsequent to the date mentioned the joint resolution was considered by the Agricultural Committee of the House of Representatives, was favorably reported to the House, and on April 7 was passed without amendment. Without doubt the legislation will receive the approval of the President.*

"It is worthy of note that the Federal Plant Quarantine Act, as now amended, not only restores to the several states the authority which it was formerly thought they possessed but greatly extends the states' authority. Briefly, the amended legislation permits the states (a) to have state quarantines or regulatory measures on interstate movements of plants and plant products when such quarantines or regulations are not in conflict with existing federal quarantines or regulations; (b) authorizes the Secretary of Agriculture to cooperate with state officials; (c) provides that states may inspect while in transit interstate shipments of plants and plant products, even though under federal certification, and if such materials are found to be dangerously diseased or infested or if the shipment is made in violation of the federal quarantine, to dispose of the material in accordance with the regulations promulgated by the state authorities. Under the Federal Plant Quarantine Act the federal authorities have no means of disposing promptly of contraband material. Under the amended legislation the states do have this right. Prosecutions for violations of quarantines, however, may be instituted by the federal authorities."

The amendment (for parliamentary reasons) was in the form of a "Joint Resolution" and as passed reads as follows:

"JOINT RESOLUTION

"For the amendment of the Plant Quarantine Act of August 20, 1912, to allow the States to quarantine against the shipment therein or through of plants, plant products, and other articles found to be diseased or infested when not covered by a quarantine established by the Secretary of Agriculture and for other purposes.

"RESOLVED BY THE SENATE AND HOUSE OF REPRESENTATIVES OF THE UNITED STATES OF AMERICA IN CONGRESS ASSEMBLED, That the Act of August 20, 1912 (Thirty-seventh United States Statutes at Large, page 315), as amended by the Act of March 4, 1917 (Thirty-ninth United States Statutes at Large, page 1165), be, and the same is hereby amended by adding at the end of section 8 thereof the following:

"PROVIDED FURTHER, That until the Secretary of Agriculture shall have made a determination that such a quarantine is necessary and has duly established the same with reference to any dangerous plant disease or insect infestation, as herein above provided, nothing in this Act shall be construed to prevent any State, Territory, or District from promulgating, enacting, and enforcing any statute, quarantine, order, rule, or regulation prohibiting or restricting the transportation of any class of nursery stock,

*The President signed the amended Act and it became law.

plant, fruit, seed, or other product or article subject to the restrictions of this section, into or through such State, Territory, District, or portion thereof, from any other State, Territory, District, or portion thereof, when it shall be found, by the State, Territory, or District promulgating or enacting the same, that such dangerous plant disease or insect infestation exists in such other State, Territory, District or portion thereof: PROVIDED FURTHER, That the Secretary of Agriculture is hereby authorized, whenever he deems such action advisable and necessary to carry out the purposes of this Act, to cooperate with any State, Territory, or District, in connection with any statute, quarantine, order, rule, or regulation enacted or promulgated by such State, Territory or District, as specified in the preceding proviso: PROVIDED FURTHER, That any nursery stock, plant, fruit, seed, or other product or article, subject to the restrictions of this section a quarantine with respect to which shall have been established by the Secretary of Agriculture under the provisions of this Act shall, when transported to, into, or through any State, Territory, or District, in violation of such quarantine, be subject to the operation and effect of the laws of such State, Territory, or District, enacted in the exercise of its police powers, to the same extent and in the same manner as though such nursery stock, plant, fruit, seed, or other product or article had been produced in such State, Territory, or District, and shall not be exempt therefrom by reason of being introduced therein in original packages or otherwise."

STATE LEGISLATION

The passing of the Joint Resolution by Congress remedied the immediate and pressing critical situation, but the effect of the Supreme Court decision was much greater and more far-reaching than was at first anticipated. After the passage of the Federal remedial legislation time and opportunity were afforded for more careful study of other aspects and effects. The conclusion was reached both by the solicitors of the United States Department of Agriculture and by Attorney Generals of a number of the states that all state quarantine rules and regulations applying to plant movement which were promulgated during the period between the passage of the Federal Plant Quarantine Act of 1912 (August 20, 1912) and its amendment in April, 1926, were without force and effect, and furthermore that such state legislation bearing on plant quarantine subjects or creating Plant Boards or similar bodies enacted during this same period was null and void, inasmuch as the Federal legislation, as interpreted by the Supreme Court, had precedence. The general effect of this opinion would be that state laws passed prior to August 20, 1912, were in abeyance until the recent amendment became law, that rules and regulations passed during this period must be again promulgated in order to be legal, and that Boards created by state legislation subsequent to August 20, 1912, were without power to function, for the Act creating them was in conflict with Federal law. In the latter class would fall our own Plant Act of 1915.

If these opinions are correct, and we believe they are, it becomes necessary for the State of Florida to take the proper action in the premises; that is, re-enact the Plant Act of 1915, followed by re-promulgation of the Plant Board rules and regulations, or for the state to enact new legislation covering the subject. The Plant Commissioner suggests that this is a matter which should receive most serious consideration. He takes the liberty of observing that the present Plant Act has been found to be weak in a number of respects and is susceptible of improvement.

SECTION II

Departmental Reports

With respect to the activities of the several departments and special projects of the Plant Board organization we submit brief summaries including essential statistical data in this section of the biennial report. Complete and detailed information is incorporated in the annual reports of department heads which are on file and available for reference in the office of the Plant Commissioner.

Grove Inspection Department
(Citrus Canker Eradication)

The Grove Inspection Department is concerned chiefly in the prosecution of the citrus canker campaign. In the last biennial report an account was given of the discovery for the second time of canker at Davie. Intensive inspection was continued at Davie and the general inspection of citrus trees throughout the state was likewise continued. The only canker infection found during the period covered by this report was at Boynton in March of 1925 when five old neglected trees located on two city lots were found to be diseased. There was an immediate concentration of inspectors and vigorous measures were instituted in cooperation with the city authorities to dispose of the large number of old abandoned trees which presented such a menace. After the "clean up" at Boynton state-wide inspection was resumed, although the whole area from West Palm Beach to Homestead was and still is under closer supervision. No other infected trees have been found.

The tabulations submitted herewith present some very interesting information when analyzed. For instance, it is shown

that the total cost of canker eradication has been $1,873,770.53, of which the state supplied $773,255.50 the Federal Government $1,015,495.41 and $85,019.62 was supplied by individuals, corporations and organizations. Again, it is shown that through this expenditure practical results have been obtained, inasmuch as only six trees have been found infected in the past three years and none since March of 1925. At this time there are no known active infections.

The number of inspectors engaged in the field work during the biennium has ranged from 23 to 28. These men inspected a total of 8,272,298 grove trees. This does not mean that that number of trees were inspected, for many trees in especially exposed areas were inspected a large number of times. It is the practice in actively infected groves to inspect at weekly intervals. It is a pleasure to report that at the close of the biennium no properties are classed as actively infected and only two such formerly infected groves are under limited restrictions.

With the limited number of inspectors engaged in grove inspection work, it is impossible to inspect all citrus trees in the state even as frequently as once in three years. It is earnestly hoped that this condition will be remedied.

The outbreak of citrus aphis in 1924 complicated the inspectional work which was being carried on at Davie very greatly. The curling of the citrus leaves, due to the aphis infestation, made inspection very difficult. As the organization was gravely concerned at this time over the canker situation at Davie, it was deemed advisable to engage in an effort to control the aphids. Little was known with respect to this insect or its control. Nevertheless, with the knowledge available, we undertook the task. We not only succeeded in controlling the aphid to a very marked degree, but, by reason of our work and the observations made, contributed in no small measure to the amount of knowledge on citrus aphis control.

The following tabulations show in detail the work which has been done by the Grove Inspection Department in the canker eradication work during the biennium.

SUMMARY OF THE GROVE INSPECTION AND CITRUS CANKER ERADICATION DEPARTMENT
YEAR ENDING JUNE 30, 1926

	No. employees on canker force	No. of trees inspected*		TOTAL NUMBER OF PROPERTIES			
		Grove	Nursery	Found infected from May 1, 1914, to date	Declared no longer danger centers	Resting under certain restrictions as to cultivation, etc.	Still classed as infected
1925							
July	26	162,480	12,877,540	512	510	24	2
Aug.	27	180,433	8,335,392	"	"	"	"
Sept.	27	436,218	10,445,463	"	"	"	"
Oct.	26	502,653	11,512,075	"	"	"	"
Nov.	26	615,417	8,503,952	"	"	"	"
Dec.	23	664,197	10,700,355	"	"	"	"
1926							
Jan.	23	829,127	10,832,533	"	"	"	"
Feb.	23	876,284	11,303,130	"	"	"	"
Mar.	27	906,430	10,683,375	"	"	"	"
Apr.	28	1,041,085	10,101,263	"	"	"	"
May	28	920,587	7,690,821	"	512	2	0
June	28	1,137,387	11,081,473	"	"	"	0
		8,272,298	124,067,372				
Prior to July 1, 1925..		85,853,320	728,251,362				
TOTALS		94,125,618	852,318,734				

No infections of citrus canker found during year ending June 30, 1926.

*Number of trees inspected for citrus canker. Nursery trees were reinspected several times during year; above figures include such reinspections. Trees in Boynton and Davie sections inspected twice, all other grove trees once.

The following summary supplies the essential information concerning the eradication of citrus canker in Florida up to June 30, 1926:

Summary

Total number of properties found infected in the state	512
Total number of properties declared no longer danger centers	512
Total number of properties still classed as active infections, June 30, 1926	0
Number of properties declared "clean"	510
Number of properties still under partial or full quarantine, June 30, 1926	2
Total number of grove trees found infected from May 1, 1914 to June 30, 1926	15,156
Total number of nursery trees found infected from May 1, 1914 to June 30, 1926	342,260
Total number of "exposed" grove trees destroyed from May 1, 1914 to June 30, 1926	242,209
Total number of "exposed" nursery trees destroyed from May 1, 1914 to June 30, 1926	2,721,850

The sums expended in this work in Florida from its inception are shown in the following tabulation:

	Federal Funds	State Funds	Other Sources
Prior to May 1, 1920	$ 860,973.51	$362,258.63	$85,019.62
May 1, 1920 to April 30, 1921	38,577.04	61,587.66	....
May 1, 1921 to June 30, 1922	16,944.42	81,555.32	....
July 1, 1922 to June 30, 1924	83,786.61	127,334.64	....
July 1, 1924 to June 30, 1925	7,997.08	66,121.83	....
July 1, 1925 to June 30, 1926	7,216.75	74,397.42	....
Totals	$1,015,495.41	$773,255.50	$85,019.62
Total, all sources			$1,873,770.53

The following tabulation shows the total number of grove trees found infected with canker by months and years since the work began in May of 1914:

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
January		306	86	14	0	0	0	0	0	1	0	0	0
February		165	21	4	1	0	0	0	0	1	0	0	0
March		444	49	9	1	1	0	0	0	2	0	5	0
April		408	49	169	2	1	0	0	0	3	0	0	0
May	108	1042	338	52	1	1	0	0	585	2	0	0	0
June	160	772	450	45	10	0	0	0	168	1	0	0	0
July	275	651	349	39	0	0	539	0	28	0	0	0	
August	1813	1345	219	30	0	1	1	0	34	0	0	0	
September	767	618	124	6	0	0	0	0	28	0	0	0	
October	565	214	451	2	0	0	0	0	19	1	0	0	
November	773	494	181	1	0	0	0	0	12	0	0	0	
December	366	256	27	1	0	0	0	0	4	0	0	0	
Total	4327	6715	2294	372	15	4	540	0	878	11	0	5	

Quarantine Department

The first and greatest purpose of the Quarantine Department is to prevent the introduction into the state of dangerous plant pests. The movement of plants and plant products is therefore

safeguarded through restrictive or prohibitory regulations. These regulations of the Plant Board are applied by the inspectors of the Quarantine Department, who are likewise collaborators of the Federal Horticultural Board and administer federal regulations applying to the entry of plants and plant products from foreign countries through Florida ports of entry. The salary and expense items of this work are borne by the state. The holding of federal appointments, however, permits of our men possessing greater authority to pass upon the horticultural material entering through our ports.

As heretofore, quarantine inspectors are stationed at Pensacola, Jacksonville, Miami, Key West and Tampa as our chief ports. Part time men are at West Palm Beach and Fort Myers. During the biennium these men boarded and inspected more than 12,000 vessels. Of these approximately one-half were from foreign ports. The great bulk of the foreign ships came directly from tropical countries, although every part of the world contributed tonnage.

The following tabulation summarizes very tersely the port quarantine work for the biennium:

	1924-25	1925-26	Total
Ships inspected:			
Foreign	2,437	2,705	5,142
Domestic (coastwise)	3,027	3,963	6,990
Total	5,464	6,668	12,132
Total number parcels inspected:			
Arriving by boat, express, mail, freight	1,633,015	2,435,470	4,068,485
Of the total there were:			
Treated and passed	192,707	865,927	1,058,634
Returned to shipper	2,630	3,766	6,396
Contraband destroyed	3,040	3,469	6,509

THE FOLLOWING TABULATION IS PRESENTED SHOWING THE WORK OF THE QUARANTINE DIVISION BY YEARS SINCE THIS WORK WAS INAUGURATED

	1915-1916	1916-1917	1917-1918	1918-1919	1919-1920	1920-1921	1921-1922	May & June, 1922	1922-1923	1923-1924	1924-1925	1925-1926	TOTAL
Foreign boats	166	1240	1777	1724	2458	3035	2225	364	2207	2309	2437	2705	22647
Total boats....	370	3257	4253	3485	4504	4948	4179	697	4559	4842	5464	6668	47226
No. packages arriving by boat, express, freight, mail	500	3105	3422	*69985	336059¾	710412½	1333333½	747972	1827727	1410860†	1633015	2435470	10515135
No. packages returned	18	255	485	1521	4936½	2130½	2610	201	1006	1566	2630	3766	21125
No. packages destroyed ..	69	1182	1037½	1743¾	2345½	1564⅓	1757	311	2278	4478	3040	3469½	23254½
No. packages treated and passed											192707	865927	1058634

*Prior to August 1, 1918, horticultural material inspected was reported by shipments. A shipment might comprise 1 or 1,000 packages. Subsequent to above date reports were made of the number of packages and bulk shipments were reduced to packages on basis of contents of standard containers used for particular products.

†Decrease in number of packages arriving was due to the Federal Horticultural Board Quarantine No. 56, prohibiting the entry of fruits from foreign countries, except under permit, which went into effect in November, 1923.

A complete list of the plant pests intercepted is presented as an appendix to this report. Some of the more important are here listed.

Intercepted During Year Ending June 30, 1925

Insect or Disease	From	Number Shipments Intercepted
Aleurocanthus woglumi Ashby (blackfly)	Cuba	8
Aleurocanthus woglumi Ashby (blackfly)	Jamaica	2
Anastrepha fraterculus Wied. (West Indian fruit fly)	Cuba	1
Anastrepha ludens (Loew.) (Morelos fruit fly)	Mexico	2
Aonidia lauri (Bouche) (scale)	Spain	1
Aonidia lauri (Bouche) (scale)	Cuba	2
Aspidiotus destructor Sign. (destructor scale)	Cuba	6
Aspidiotus destructor Sign. (destructor scale)	Porto Rico	1
Ceratitis capitata Wied. (Mediterranean fruit fly)	Spain	1
Coccus viridis (Green) (green scale)	Cuba	1
Diplodia natalensis Ev. (fungus)	Cuba	1
Eriococcus araucariae Mask. (Araucaria eriococcus)	Spain	1
Lepidosaphes crotonis (Ckll.) (scale)	Porto Rico	1
Lepidosaphes lasianthi (Green) (scale)	Santo Domingo	1
Pectinophora gossypiella (Saunders) (pink bollworm)	China	1
Pectinophora gossypiella (Saunders) (pink bollworm)	Cuba	1
Phthorimaea operculella Zell. (potato tuber moth)	Germany	1
Phthorimaea operculella Zell. (potato tuber moth)	Island of Malta	1
Pseudaonidia articulatus (Morg.) (rufous scale)	Cuba	8
Pseudaonidia articulatus (Morg.) (rufous scale)	Bahama Islands	1
Pseudaonidia articulatus (Morg.) (rufous scale)	Jamaica	2
Pseudaonidia articulatus (Morg.) (rufous scale)	Mexico	1
Pseudaonidia articulatus (Morg.) (rufous scale)	Spain	1
Pseudaonidia articulatus (Morg.) (rufous scale)	St. Lucia, B. W. I.	1
Pseudaonidia tesserata (de Charm) (scale)	Cuba	1
Targionia hartii (Ckll.) (yam scale)	Cuba	1
Targionia hartii (Ckll.) (yam scale)	Santo Domingo	1

Insect or Disease	From	Number Shipments Intercepted
Tyloderma fragariae Riley (strawberry crown borer)	Arkansas	1
Tyloderma fragariae Riley (strawberry crown borer)	Alabama	1
Uromyces caryophyllinus (Schr.) Wint. (carnation rust)	Pennsylvania	1

Intercepted During Year Ending June 30, 1926

Insect or Disease	From	Number Shipments Intercepted
Aleurocanthus woglumi Ashby (blackfly)	Cuba	8
Aleurocanthus woglumi Ashby (blackfly)	Bahama Islands	1
Aleurocanthus woglumi Ashby (blackfly)	Jamaica	1
Anastrepha fraterculus Wied. (West Indian fruit fly)	Cuba	1
Aspidiotus destructor Sign. (destructor scale)	Cuba	10
Aspidiotus destructor Sign. (destructor scale)	Porto Rico	1
Aspidiotus destructor Sign. (destructor scale)	Santo Domingo	1
Aonidia lauri (Bouche) (scale)	Italy	1
Coccus viridis (Green) (green scale)	Cuba	1
Diarthronomyia hypogaea Loew. (chrysanthemum midge)	Pennsylvania	16
Iridomyrmex humilis Mayr. (Argentine ant)	Alabama	1
Iridomyrmex humilis Mayr. (Argentine ant)	Louisiana	1
Parlatoria sp. (scale)	Trinidad	1
Phthorimaea operculella Zell. (potato tuber moth)	Virginia	1
Pseudaonidia articulatus (Morg.) (rufous scale)	Bahama Islands	4
Pseudaonidia articulatus (Morg.) (rufous scale)	British West Indies	1
Pseudaonidia articulatus (Morg.) (rufous scale)	Costa Rica	1
Pseudaonidia articulatus (Morg.) (rufous scale)	Cuba	7
Pseudaonidia articulatus (Morg.) (rufous scale)	Guatemala	1
Pseudaonidia articulatus (Morg.) (rufous scale)	Jamaica	1
Pseudaonidia articulatus (Morg.) (rufous scale)	Trinidad	1
Pseudaonidia articulatus (Morg.) (rufous scale)	West Indies	1
Uromyces caryophyllinus (Schr.) Wint. (carnation rust)	Pennsylvania	9
Vinsonia stellifera (Westw.) (stellate scale)	Bahama Islands	2
Xylostodoris luteolus Barber (royal palm bug)	Cuba	1

During the year ending June 30, 1925, insect pests and plant diseases were intercepted on material arriving at Florida ports from 42 foreign countries:

1. Africa
2. Algeria
3. Argentina
4. Bahamas
5. Barbados, B.W.I.
6. Belgium
7. Bermuda
8. Brazil
9. British West Indies
10. Canal Zone (Panama)
11. Canary Islands
12. Cape Verde Islands
13. Chile
14. China
15. Costa Rica
16. Cuba
17. Dominica
18. England
19. France
20. Germany
21. Gibraltar
22. Grand Cayman
23. Greece
24. Holland
25. Honduras
26. India
27. Island of Malta
28. Italy
29. Jamaica
30. Japan
31. Mexico
32. Norway
33. Porto Rico
34. Santo Domingo
35. Scotland
36. Spain
37. Spanish Honduras
38. St. Lucia (B. W. I.)
39. Trinidad
40. Uruguay
41. Virgin Islands
42. Wales

During the year ending June 30, 1926, insect pests and plant diseases were intercepted on material arriving at Florida ports from 39 foreign countries:

1. Africa
2. Algeria
3. Argentina
4. Austria
5. Azores
6. Bahama Islands
7. Barbados (B. W. I.)
8. Belgium
9. Bermuda
10. Brazil
11. Canada
12. Chile
13. Costa Rica
14. Cuba
15. Denmark
16. Ecuador
17. England
18. France
19. Germany
20. Grand Cayman
21. Guatemala
22. Haiti
23. Holland
24. Honduras
25. Isle of Pines
26. Jamaica
27. Italy
28. Mexico
29. Panama
30. Porto Rico
31. Santo Domingo
32. Scotland
33. Spain
34. Sweden
35. Trinidad
36. Tunis
37. Venezuela
38. Wales
39. West Indies

NURSERY INSPECTION DEPARTMENT

Inspection of nursery stock has been a practice followed in all states where horticulture is of importance. Such service is rendered in practically every well organized government. On account of the magnitude of the horticultural interests of Florida demanding protection and the semi-tropical conditions existing

in this state, the nursery inspection service may be regarded as of prime importance. Of recent years this service has been highly developed and from the standpoint of efficiency may well be compared with similar services in wealthier commonwealths. And yet we are far from feeling that suitable or adequate service is rendered. As an illustration, we may say that our goal, since the creation of the State Plant Board ten years ago, has been to make four inspections annually of all commercial nurseries. We have never done so. In 1924-25 we averaged 2.4 inspections per nursery. In 1925-26 the average was 2.6.

The Nursery Inspector, in his annual reports for the fiscal years 1924-25 and 1925-26, has presented a mass of statistical matter pertaining to the activities of the Nursery Inspection Department. This material is of value as a permanent record for reference and is available to officials and citizens desiring to obtain special information. It is so voluminous, however, that we do not deem it wise or necessary to publish it in full in this report. What may be termed the "high-lights" are here presented:

During 1924-25 there were eleven assistant nursery inspectors, while in 1925-26 the department had available thirteen such attaches. These men had 4,568 nurseries of all kinds under inspection in 1924-25 and 3,059 in 1925-26. In 1924-25 these nurseries contained 68,004,635 trees and plants, while in 1925-26 there were a total of 81,746,963 trees and plants under inspection. The acreage in nursery plantings was as follows:

	Citrus	Non-citrus	Total
1924-25	5,843	3,187	9,030
1925-26	6,390	3,035	9,425

The two outstanding objectives in nursery inspection are: (a) to discover and prevent distribution of plant pests particularly of a major nature, such as citrus canker, blackfly, etc., and (b) to see that the orchard planter does not begin his operations laboring under the handicap of pest infested trees. In the prosecution of its activities the Nursery Inspection Department has not during the biennium discovered any nurseries affected by major pests. On the whole, the nurseries have been well maintained. This is especially true of the larger operators. That we have been instrumental in protecting the orchardists, however,

from receiving trees affected by the minor pests is evidenced by the fact that during the biennium 3,233 certification withdrawals or refusals of certification were handled through the department. Some small nurseries repeatedly failed to pass inspection, which increases the total considerably.

Compliance with the requirements of the Board upon the part of nursery stock producers has been excellent. There seems to be an appreciation by nurserymen of the necessity for state supervision and of the benefits thereof both to producer and consumer of stock. It has only been necessary to file information four times for violation of the Board's rules.

Following is a brief summary showing the more important data regarding the activities of the Nursery Inspection Department:

SUMMARY—NURSERY INSPECTION DEPARTMENT

BIENNIUM ENDING JUNE 30, 1926

	1924–1925	1925–1926
Total number nurseries under inspection	4,568	3,059
Total acreage in nurseries under inspection	9,030	9,425
Total amount of stock in nurseries under inspection	68,004,635	81,746,963
Total amount of stock in nurseries refused certification	14,189,934	24,395,585
Total acreage in citrus stock as of June 30	5,843	6,390
Total acreage in non-citrus stock as of June 30	3,187	3,035
Total amount of citrus stock as of June 30	54,432,832	52,711,485
Total amount of non-citrus stock as of June 30	13,571,803	29,035,478*
Average number of inspections per nursery per annum	2.4	2.6

As in the past, the Department has issued so-called "Permit Certificates" for use on stock to be shipped into this state. During 1924-25, 36,942 such certificates were issued to 298 concerns and in 1925-26, 37,552 certificates to 346 nurseries. In all cases where shipments are made into Florida an invoice containing certain essential information is required. This is also required for stock produced in Florida and handled under certificate. The object sought is to have a permanent record so that in the event of a serious outbreak of a plant pest it would be a relatively easy matter to run down all suspicious shipments or shipments originating in the nursery in which the pest was discovered.

*The marked increase in 1925-26 over 1924-25 due partially to the Department placing ferneries under inspection.

DEPARTMENT OF ENTOMOLOGY

As has been repeatedly stated, the State Plant Board is primarily a regulatory or police organization, yet a certain amount of scientific work must be done by specialists in order that the organization may function efficiently. In the entomological field this phase of Plant Board work is performed by the Board's Entomologist and an Associate Entomologist. These officials make necessary investigations, carry on research in a limited way and identify and classify insect pests attacking plants. In regulatory work the latter activity is a very important one indeed. The following table indicates the volume of this kind of work which the Department performs:

SPECIMENS EXAMINED AND RECORDED ANNUALLY
(April 30, 1915 through June 30, 1926)

1915-1916	388
1916-1917	612
1917-1918	2593
1918-1919	1921
1919-1920	2521
1920-1921	1998
1921-1922	3545
1922-1923	3904
1923-1924	2418
1924-1925	2940
1925-1926	2023
1915-1926—Total	24,863

The Department has continued to produce and distribute fungus for the control of the citrus whitefly. A nominal charge is made to growers who apply for this fungus. The same is true in connection with the collection, rearing and distribution of Vedalia, a predatory insect which preys upon and materially assists in the control of the cottony cushion-scale. During the biennium 1,013½ cultures of whitefly fungus and 457¼ colonies of Vedalia were sent into the field by the Department.

CITRUS APHIS

In connection with the routine work of the Department the Entomologist and Associate Entomologist have participated in the investigations regarding the new (?) pest attacking citrus commonly called "the citrus aphis", for which an allotment was made from the Emergency Fund of the Board. This work has been conducted cooperatively by the Plant Board and the Experiment Station. Special investigators have been employed in

addition to the regular members of the entomological staffs of the Board and the Station. Research has been conducted along entomological lines as to the biology of the insect and methods of control. In the pathological field efforts have been made to learn of diseases affecting the insect and ways of disseminating these diseases to the end that natural control measures may be used in conjunction with sprays and (or) fumigants. At the same time predatory insects are being sought. Progress has been made and it is hoped that ultimately a relatively cheap and effective control will be developed.

Celery Insect Investigations

For some years past the celery growers in the Sanford area have sustained serious loss and damage through insect depredation. The last session of the legislature included in the appropriation for the State Plant Board an item for prosecution of an investigation of this situation to the end that the damage might be alleviated. The Board was fortunate in securing for this purpose the services of an eminent entomologist, Doctor E. D. Ball, who had just resigned as Director of Scientific Research, United States Department of Agriculture. Doctor Ball was appointed Associate Entomologist, provided with a laboratory and the necessary equipment at Sanford, and supplied an assistant. He has been engaged in carrying on special investigations particularly into the life history and habits of the celery leaf-tyer, the insect which has occasioned the most damage to the celery crop. Doctor Ball has not by any means overlooked the more practical aspect of the project, i. e., control, and has engaged in a field study of this in conjunction with the Sanford growers. It is sincerely trusted that provision will be made for the continuance of this work either as at present or under the auspices of the Agricultural Experiment Station.

DEPARTMENT OF PLANT PATHOLOGY

The Plant Board does not maintain a separate and distinct pathological organization as such. In cooperation with the Agricultural Experiment Station, however, much investigational and identification work in connection with plant diseases has been made possible. The chief of the Department of Plant Pathology of the Station holds appointment as Pathologist on the Plant Board staff. In the several special pieces of work which

are under way assistant plant pathologists are appointed and paid by the Board. Special investigations are thus being conducted with respect to citrus canker, citrus aphis, scaly bark, coconut bud rot and diseases of strawberries. The canker investigations and those of scaly bark and coconut bud rot are continuing activities from previous years. The others have been undertaken during the present biennium. Reference has been made to the aphis under the report on the Entomological Department. The strawberry disease work was instituted as the result of a special appropriation being made for that purpose by the last legislature. A laboratory has been equipped and this work is being carried on chiefly at Plant City.

Laboratory facilities for carrying on special research in connection with coconut bud rot and scaly bark have been provided at Gainesville. The coconut bud rot situation is one which had occasioned special concern at the time of presentation of the last biennial report. It now seems that this affection does not do the enormous damage in Florida as elsewhere, nor does it appear to be as infectious. The general situation is being handled through quarantines on affected nurseries imposed by the Nursery Inspection Department and seems to be well in hand. In the Annual Reports of the Florida Agricultural Experiment Station may be found statements as to the progress being made in connection with the scientific investigations being carried on cooperatively.

Mosaic Disease of Sugar Cane

Although no special work of an investigational nature has been carried on in connection with this disease, reference should here be made to what has been done to prevent the spread. Previous reports have told how this cane disease was introduced into Florida and the efforts to at first eradicate and later to prevent spread. As was predicted, the disease has gradually spread throughout the whole northern tier of counties and has been found as far south as Alachua County. It is only a matter of time until the whole cane growing area will be involved. Unquestionably the quarantine regulations of the Board have retarded the spread and afforded the unaffected areas opportunity to prepare for the invasion. The outlook for continued production is good if growers will use only varieties of cane which are tolerant, resistant or immune to the disease.

APIARY INSPECTION DEPARTMENT

Under the Bee Disease Act of 1919 the State Plant Board has maintained an apiary inspection service. The purpose is to prevent and control serious diseases affecting honeybees. An Apiary Inspector has been in charge of this work, assisted by a number of "local inspectors". The Apiary Inspector is a trained specialist, while the local inspectors are practical beekeepers who are familiar with bee diseases. The Board has adopted the policy of "eradication" in handling the most serious of the bee diseases, American foul brood. There has never been a great quantity of this in the state and it was felt there was a very fair prospect of success. During the year ending June 30, 1925, 53 colonies in 7 apiaries were found infected with American foul brood, while for the year ending June 30, 1926, but 20 colonies in 5 apiaries (in four counties) were found affected.

The progress of the work of eradication is best shown by the following table.

SUMMARY OF APIARY INSPECTION WORK SINCE THE DEPARTMENT WAS CREATED IN JULY, 1919

Year Ending	Apiaries inspected	Colony inspections	Apiaries infected with American foul brood	Colonies infected with American foul brood
June 30, 1920	366	15007	37	103
June 30, 1921	739	17931	21	30
June 30, 1922	822	22221	17	34
June 30, 1923	1012	23883	18	30
June 30, 1924	785	21857	9	13
June 30, 1925	670	22566	7	53
June 30, 1926	697	17617	5	20

SECTION III

ESTIMATES

The Plant Commissioner submits to the Board estimates of amounts of funds believed to be necessary to properly conduct the inspectional and other activities of the Board for the biennium beginning July 1, 1927. The estimates are as follows:

ADMINISTRATIVE EXPENSES OF BOARD

Salaries:	Per annum	For biennium
Secretary	$1,500.00	$3,000.00
Stenographer	1,000.00	2,000.00
Total for Salaries	$2,500.00	$5,000.00

Operating Expenses:		
Traveling expenses of Board members and Secretary and miscellaneous office expenses	1,500.00	3,000.00
Total for Administration, Board	$4,000.00	$8,000.00

PLANT COMMISSIONER'S OFFICE
(General Expenses)

Salaries:	Per annum	For biennium
Plant Commissioner	$3,300.00	$6,600.00
Assistant Plant Commissioner (supplementing salary of department head designated to act)	500.00	1,000.00
Chief Clerk	2,400.00	4,800.00
Stenographer	1,800.00	3,600.00
Filing Clerk	1,500.00	3,000.00
Janitor	750.00	1.500.00
Total for Salaries	$10,250.00	$20,500.00
Operating Expenses:		
Traveling Expenses	$1,500.00	$3,000.00
Printing of Quarterly Bulletin, Circulars, etc., Office Equipment, Postage, Stationery, Telephone and Telegraph, Miscellaneous Expenses	5,700.00	11,400.00
Total for Expenses	7,200.00	14,400.00
Total for Plant Commissioner's Office	$17,450.00	$34,900.00

GROVE INSPECTION DEPARTMENT
(Citrus Canker Eradication)

Salaries:	Per annum	For biennium
Chief Inspector	$4,000.00	$8,000.00
10 Supervising Inspectors (foremen) at average of $2,700 per annum	27,000.00	54,000.00
30 Inspectors at average of $2,400 per annum	72,000.00	144,000.00
1 Stenographer and Filing Clerk	1,500.00	3,000.00
Total for Salaries	$104,500.00	$209,000.00
Operating Expenses:		
Travel and subsistence for chief and assistants	$ 30,500.00	$ 61,000.00
Office Supplies, Field Equipment, Labor and Miscellaneous Expenses	5,000.00	10,000.00
Total for Expenses	$ 35,500.00	$ 71,000.00
Total for Grove Inspection Department	$140,000.00	$280,000.00

NURSERY INSPECTION DEPARTMENT

Salaries:	Per annum	For biennium
Chief Inspector	$ 4,000.00	$ 8,000.00
20 Assistant Inspectors at average of $2,700 per year	54,000.00	108,000.00
4 Stenographers at average of $1,500 per year	6,000.00	12,000.00
1 Filing Clerk	1,500.00	3,000.00
Total for Salaries	$ 65,500.00	$131,000.00

Operating Expenses:		
Travel and subsistence for chief and assistant inspectors	$ 20,000.00	$ 40,000.00
Office and Field Equipment and Supplies, Stationery and Miscellaneous Expenses	5,000.00	10,000.00
Total for Expenses	$ 25,000.00	$ 50,000.00
Total for Nursery Inspection Department	$ 90,500.00	$181,000.00

Quarantine Inspection Department

Salaries:	Per annum	For biennium
Chief Inspector	$ 4,000.00	$ 8,000.00
22 Assistant Inspectors:		
6 at average of $3,600 per year	21,600.00	43,200.00
(Supervising inspectors in charge of ports)		
12 at average of $3,000 per year	36,000.00	72,000.00
4 at average of $3,000 per year	12,000.00	24,000.00
(Mounted motorcycle patrol)		
1 Stenographer and Filing Clerk	1,800.00	3,600.00
Total for Salaries	$ 75,400.00	$150,800.00
Operating Expenses:		
Travel and subsistence expenses of chief and assistants (not including mounted inspectors)	$ 15,000.00	$ 30,000.00
Fumigants and other supplies and equipment, office and field expenses	5,000.00	10,000.00
Travel and subsistence expenses and equipment for mounted patrol	6,000.00	12,000.00
Total for Expenses	$ 26,000.00	$ 52,000.00
Total for Quarantine Inspection Department	$101,400.00	$202,800.00

Department of Entomology

Salaries:	Per annum	For biennium
Entomologist	$ 3,500.00	$ 7,000.00
Assistant Entomologist	3,000.00	6.000.00
Stenographer and Filing Clerk	1,500.00	3,000.00
Total for Salaries	$ 8,000.00	$ 16,000.00
Operating Expenses:		
Laboratory and office equipment and supplies, library acquisitions, travel and subsistence	$ 2,000.00	$ 4,000.00
Total for Department of Entomology	$ 10,000.00	$ 20,000.00

Investigation of Celery Pests

Salaries:	Per annum	For biennium
Entomologist	$ 4,000.00	$ 8,000.00
Assistant Entomologist	2,400.00	4,800.00
Total for Salaries	$ 6,400.00	$ 12,800.00
Operating Expenses:		
Field, office and laboratory equipment and supplies, labor, travel and subsistence	4,000.00	8,000.00
Total for Celery Pest Investigations	$ 10,400.00	$ 20,800.00

Department of Plant Pathology

Salaries:	Per annum	For biennium
Pathologist (in cooperation with Agricultural Experiment Station)	$ 500.00	$ 1,000.00
1 Assistant Pathologist (Citrus Canker Investigations)	3,000.00	6,000.00
1 Assistant Pathologist (Palm Disease Investigations)	3,000.00	6,000.00
1 Assistant Pathologist (Strawberry Disease Investigations)	3,000.00	6,000.00
Total for Salaries	$ 9,500.00	$ 19,000.00
Operating Expenses:		
Field, laboratory and office equipment and supplies, labor, travel and subsistence, fertilizer, etc.		
For Plant Pathologist	$ 500.00	$ 1,000.00
For Citrus Canker Investigations	1,500.00	3,000.00
For Palm Diseases Investigations	1,500.00	3,000.00
For Strawberry Disease Investigations	2,000.00	4,000.00
Total for Expenses	$ 5,500.00	$ 11,000.00
Total for Department of Plant Pathology	$ 15,000.00	$ 30,000.00

Fumigation Investigations

Salaries:	Per annum	For biennium
Special Investigator	$ 4,000.00	$ 8,000.00
Operating Expenses:		
Field and laboratory supplies, travel and subsistence expenses, fumigation, etc.	1,000.00	2,000.00
Total for Fumigation Investigations	$ 5,000.00	$ 10,000.00

Apiary Inspection

Salaries:	Per annum	For biennium
Apiary Inspector	$ 3,500.00	$ 7,000.00
Local Assistant Inspectors at $7.00 per day w. a. e. (500 man days)	3,500.00	7,000.00
Total for Salaries	$ 7,000.00	$ 14,000.00
Operating Expenses:		
Field and office equipment and supplies, travel and subsistence expenses, etc.	$ 4,000.00	$ 8,000.00
Total for Apiary Inspection Department	$ 11,000.00	$ 22,000.00

Recapitulation

	Salaries	For Biennium Expenses	Total
Administration, Board	$ 5,000	$ 3,000	$ 8,000
Plant Commissioner's Office (General Expenses)	20,500	14,400	34,900
Grove Inspection Department (Citrus Canker Eradication)	209,000	71,000	280,000
Nursery Inspection Department	131,000	50,000	181,000
Quarantine Inspection Department	150,800	52,000	202,800
Department of Entomology	16,000	4,000	20,000
Investigation of Celery Pests	12,800	8,000	20,800
Department of Plant Pathology	19,000	11,000	30,000
Fumigation Investigations	8,000	2,000	10,000
Department of Apiary Inspection (Bee Disease Eradication)	14,000	8,000	22,000
Totals	$586,100	$223,400	$809,500
Emergency Fund			$100,000
			$909,500

FINANCIAL REPORT

Fiscal Year Ending June 30, 1925

Tallahassee, Fla., October 1, 1925.

To the State Plant Board:

Gentlemen: I herewith submit the following report of the receipts and disbursements of the Board during the fiscal year beginning July 1, 1924, and ending June 30, 1925:

Summary of receipts and disbursements together with the balances in the different funds of the State Plant Board.

Name of Fund	*Receipts*	*Disbursements*	*Balances*
Continuing Appropriation, Chapter 6885	$ 70,000.00	$ 35,000.00	$ 35,000.00
General Appropriation Chapter 9121, Section 1	150,000.00	150,000.00	....
Controlling the Boll Weevil and other Cotton Insects, Chapter 9187	19,886.63	19,886.63	....
Emergency Appropriation Chapter 9121, Section 2			
Coconut Bud Rot Disease Investigation	10,000.00	10,000.00	....
Citrus Aphis Investigation	10,000.00	9,115.77	884.23
Incidental Fund	4,697.72	3,409.60	1,288.12
Total	$264,584.35	$227,412.00	$ 37,172.35

CONTINUING APPROPRRIATION (CHAPTER 6885)

RECEIPTS:		
Balance Brought Forward July 1, 1924		$ 35,000.00
Continuing Appropriation Available May 1, 1925		35,000.00
		$70,000.00
DISBURSEMENTS:		
Administrative:		
For Salary of Secretary	$ 1,250.00	
For Traveling Expenses Board Members	457.26	
		$ 1,707.26
Plant Commissioner's Office:		
For Salaries	$ 6,760.00	
For Traveling Expenses	301.59	
For Office Supplies	879.94	
For Freight and Express	20.62	
For Printing	2,768.93	
For General Supplies	7.00	
		$ 10,738.08
Entomological Department:		
For Salaries	$ 5,165.74	
For Traveling Expenses	216.42	
For Office Supplies	637.69	
For Freight and Express	8.40	
For Printing	79.45	
For General Supplies	123.98	
		$ 6,231.68
Mosaic Disease Eradication:		
For Salaries	$ 12.00	
For Traveling Expenses	710.59	
For Office Supplies	7.40	
For General Supplies	42.40	
		$ 772.39
Citrus Canker Eradication:		
For Salaries	$ 5,989.99	
For Traveling Expenses	2,776.80	
For Office Supplies	18.15	
For General Supplies	114.72	
For Miscellaneous Expenses	10.00	
		$ 8,909.66
Quarantine Department:		
For Salaries	$ 4,573.32	
For Traveling Expenses	1,826.82	
For Office Supplies	210.49	
For Freight and Express	7.30	
For Printing	23.00	
		$ 6,640.93
Total		$ 35,000.00
Balance Carried Forward July 1, 1925		$ 35,000.00

General Appropriation, Chapter 9121, Section 1.

Receipts:		
Appropriation Available July 1, 1924		$150,000.00
Disbursements:		
Citrus Canker Eradication:		
For Salaries	$35,979.53	
For Traveling Expenses	13,652.92	
For Office Supplies	686.00	
For Freight and Express	53.24	
For Printing	10.65	
For General Supplies	6,749.83	
For Miscellaneous Supplies	80.00	
		$ 57,212.17
Nursery Inspection:		
For Salaries	$26,321.34	
For Traveling Expenses	15,639.46	
For Office Supplies	1,557.83	
For Freight and Express	.48	
For Printing	302.01	
For General Supplies	9.50	
		$ 43,830.62
Quarantine Department:		
For Salaries	$22,378.46	
For Traveling Expenses	8,951.43	
For Office Supplies	256.30	
For Freight and Express	163.57	
For Printing	831.96	
For General Supplies	605.56	
		$ 33,187.28
Sweet Potato Weevil Eradication:		
For Salaries	$ 901.15	
For Traveling Expenses	565.38	
For Office Supplies	1.99	
For Freight and Express	39.00	
For General Supplies	341.87	
		$ 1,849.39
Bee Disease Eradication:		
For Salaries	$ 4,618.62	
For Traveling Expenses	2,158.49	
For Office Supplies	33.03	
For Freight and Express	4.36	
For General Supplies	55.94	
		$ 6,870.44
Mosaic Disease Eradication:		
For Salaries	$ 1.00	
For Traveling Expenses	100.50	
For General Supplies	133.00	
		$ 234.50
Department of Entomology:		
For Salaries	$ 766.65	
For Office Supplies	890.72	
For Printing	150.50	
For General Supplies	187.19	
		$ 1,995.06

Boll Weevil Investigation:		
For Salaries	$ 1,650.00	
		$ 1,650.00
Administrative:		
For Salary, Secretary Plant Board	$ 250.00	
		$ 250.00
Plant Commissioner's Office:		
For Salaries	$ 1,225.00	
For Traveling Expenses	205.53	
For Office Supplies	636.57	
For Printing	562.44	
For General Supplies	291.00	
		$ 2,920.54
		$150,000.00

Emergency Appropriation, Chapter 9121, Section 2.

Coconut Bud Rot Disease Investigation:		
RECEIPTS:		
Amount declared to be available by the Governor and the State Plant Board		$ 10,000.00
DISBURSEMENTS:		
For Salaries	$ 4,511.34	
For Traveling Expenses	2,859.34	
For Office Supplies	215.94	
For Freight and Express	21.19	
For Printing	5.00	
For General Supplies	2,387.19	
		$ 10,000.00
Citrus Aphis Investigation:		
RECEIPTS:		
Amount declared to be available by the Governor and the State Plant Board		$ 10,000.00
DISBURSEMENTS:		
For Salaries	$ 1,805.57	
For Traveling Expenses	2,884.67	
For Office Supplies	622.11	
For Printing	63.45	
For General Supplies	2,739.97	
		$ 9,115.77
Balance Brought Forward July 1, 1925		$ 884.23

SPECIAL APPROPRIATION CONTROLLING THE BOLL WEEVIL AND OTHER COTTON INSECTS, CHAPTER 9187.

RECEIPTS:		
Balance Brought Forward July 1, 1924		$ 4,886.63
Appropriation Available July 1, 1924		15,000.00
DISBURSEMENTS:		$ 19,886.63
Boll Weevil Investigation:		
For Salaries	$ 4,666.86	
For Traveling Expenses	1,351.20	
For Office Supplies	279.62	
For Freight and Express	66.86	
For Printing	25.18	
For General Supplies	1,115.98	
For Miscellaneous Expenses	100.00	
Cotton Disease Investigation:		$ 7,605.70
For Salaries	$ 4,311.75	
For Traveling Expenses	473.70	
For Office Supplies	713.42	
For Freight and Express	134.70	
For Printing	17.50	
For General Supplies	2,634.41	
Fertilizer and Variety Tests:		$ 8,285.48
For Salaries	$ 1,746.67	
For Traveling Expenses	189.44	
For Office Supplies	232.11	
For Freight and Express	29.84	
For General Supplies	1,327.14	
For Miscellaneous Expenses	468.27	
Administrative Expenses:		$ 3,993.47
For Freight and Express	$ 1.98	
		$ 1.98
		$ 19,886.63

INCIDENTAL FUND

RECEIPTS:		
Balance Brought Forward July 1, 1924		$ 2,158.97
Receipts Collected July 1, 1924 to July 1, 1925		2,538.75
DISBURSEMENTS:		$ 4,697.72
For Salaries	$ 1,653.28	
For Traveling Expenses	243.02	
For Office Supplies	371.24	
For Freight and Express	51.09	
For Printing	225.36	
For General Supplies	565.61	
For Miscellaneous Expenses	300.00	
		$ 3,409.60
Balance Carried Forward July 1, 1925		$ 1,288.12

Respectfully submitted,

J. T. DIAMOND,

Secretary, State Plant Board.

FISCAL YEAR ENDING JUNE 30, 1926.

Tallahassee, Florida, Oct. 1, 1926.

To the State Plant Board:

GENTLEMEN: I herewith submit the following report of the receipts and disbursements of the Board for the fiscal year beginning July 1, 1925, and ending June 30, 1926.

Summary of receipts and disbursements together with the balances in the different funds of the State Plant Board.

Name of the Fund	*Receipts*	*Disbursements*	*Balances*
Continuing Appropriation, Chapter 6885	$ 70,000.00	$ 35,000.00	$ 35,000.00
General Appropriation, Chapter 11,332	221,205.00	212,856.87	8,348.13
Emergency Appropriation, Chapter 11,332, Section 2 Citrus Aphis Investigation	10,884.23	9,379.55	1,504.68
Incidental Fund	4,913.06	3,352.97	1,560.09
Total	$307,002.29	$260,589.39	$ 46,412.90

CONTINUING APPROPRIATION (CHAPTER 6885)

RECEIPTS:

Balance Brought Forward, July 1, 1925		$ 35,000.00
Continuing Appropriation Available May 1, 1926		35,000.00
		$ 70,000.00
DISBURSEMENTS:		
Administrative:		
For Salary of Secretary	$ 1,250.00	
For Traveling Expenses, Board Members	640.49	
		$ 1,890.49
Plant Commissioner's Office:		
For Salaries	$ 7,400.00	
For Traveling Expenses	592.19	
For Office Supplies	2,293.30	
For Freight and Express	10.38	
For Printing	992.01	
		$ 11,287.88
Entomological Department:		
For Salaries	$ 5,846.60	
For Traveling Expenses	74.93	
For Office Supplies	593.01	
For Freight and Express	11.93	
For Printing	41.25	
For General Supplies	703.69	
		$ 7,271.41
Mosaic Disease Eradication:		
For Salaries	$ 77.50	
For Traveling Expenses	749.54	
For Office Supplies	2.20	
		$ 829.24

Citrus Canker Eradication:

For Salaries	$ 9,771.99	
For Traveling Expenses	3,623.72	
For Office Supplies	61.08	
For General Supplies	239.19	
		$ 13,695.98

Nursery Inspection:

For Office Supplies	$ 25.00	
Total		$ 35,000.00
Balance Carried Forward, July 1, 1926		$ 35,000.00

General Appropriation, Chapter 11,332.

Receipts:

Appropriation Available July 1, 1925		$221,205.00

Disbursements:

Citrus Canker Eradication:

For Salaries	$42,045.16	
For Traveling Expenses	17,071.63	
For Office Supplies	281.27	
For Freight and Express	54.10	
For Printing	17.25	
For General Supplies	1,187.03	
For All Other Purposes	45.00	
		$ 60,701.44

Nursery Inspection:

For Salaries	$37,949.75	
For Traveling Expenses	14,887.36	
For Office Supplies	3,521.07	
For Freight and Express	7.86	
For Printing	566.18	
For General Supplies	7,903.69	
		$ 64,835.91

Quarantine Department:

For Salaries	$32,607.28	
For Traveling Expenses	11,666.91	
For Office Supplies	764.88	
For Freight and Express	98.32	
For Printing	219.98	
For General Supplies	2,395.03	
		$ 47,752.40

Sweet Potato Weevil Eradication:

For Salaries	$ 330.65	
For Traveling Expenses	377.88	
For Office Supplies	1.13	
		$ 709.66

Bee Disease Eradication:

For Salaries	$ 3,313.30	
For Traveling Expenses	2,089.18	
For Office Supplies	5.74	
For Freight and Express	1.24	
For Printing	25.00	
For General Supplies	44.98	
For All Other Purposes	17.50	
		$ 5,496.94

Coconut Bud Rot Survey:		
For Salaries	$ 8,038.32	
For Traveling Expenses	1,709.88	
For Office Supplies	272.01	
For Freight and Express	13.82	
For General Supplies	3,375.45	
		$ 13,409.48
Plant Pathology:		
For Salaries	$ 1,949.98	
For Traveling Expenses	78.15	
		$ 2,028.13
Department of Entomology:		
For Salaries	$ 1,202.82	
For Traveling Expenses	20.95	
For Office Supplies	442.48	
For Printing	485.00	
For General Supplies	242.57	
		$ 2,393.82
Mosaic Disease Eradication:		
For Traveling Expenses	$ 90.00	
		$ 90.00
Celery Disease Investigation:		
For Salaries	$ 4,183.33	
For Traveling Expenses	518.46	
For Office Supplies	399.72	
For Freight and Express	1.00	
For General Supplies	639.08	
		$ 5,741.59
Strawberry Disease Investigation:		
For Salaries	$ 2,241.79	
For Traveling Expenses	797.08	
For Office Supplies	168.08	
For Freight and Express	23.18	
For Printing	1,313.66	
For General Supplies	690.22	
		$ 5,234.01
Plant Commissioner's Office:		
For Salaries	$ 1,500.00	
For Traveling Expenses	312.60	
For Office Supplies	865.93	
For Freight and Express	53.16	
For Printing	1,481.80	
		$ 4,213.49
Administrative:		
For Salary, Secretary Plant Board	$ 250.00	
		$ 250.00
		$212,856.87
Balance Carried Forward, July 1, 1926		$ 8,348.13

Citrus Aphis Investigation

Receipts:

Balance Brought Forward, July 1, 1925		$ 884.23
Amount of the Emergency Appropriation Declared to be Available		$ 10,000.00
		$ 10,884.23

Disbursements:

For Salaries	$ 5,580.41	
For Traveling Expenses	2,080.76	
For Office Supplies	131.41	
For Freight and Express	1.51	
For Printing	4.50	
For General Supplies	1,580.96	
		$ 9,379.55
Balance Carried Forward, July 1, 1926		$ 1,504.68

Incidental Fund

Receipts:

Balance Brought Forward July 1, 1925		$ 1,288.12
Receipts Collected from July 1, 1925 to July 1, 1926		3,624.94
		$ 4,913.06

Disbursements:

For Salaries	$ 914.09	
For Traveling Expenses	275.96	
For Office Supplies	604.71	
For Freight and Express	102.90	
For Printing	249.42	
For General Supplies	234.64	
For All Other Purposes	971.25	
		$ 3,352.97
Balance Carried Forward July 1, 1926		$ 1,560.09

Respectfully submitted,

J. T. Diamond,

Secretary, State Plant Board.

APPENDIX A

PLANT PESTS AND DISEASES INTERCEPTED BY STATE PLANT BOARD 1925-26

PESTS AND DISEASES INTERCEPTED*

Shipments by all means of transportation except Parcel Post

Year Ending June 30, 1925

Insect or Disease	Occurring on	From	Number of Shipments Infested
Acuminate scale (*Coccus acuminatus* (Sign.))	Gardenia	Cuba	1
Acuminate scale (*Coccus acuminatus* (Sign.))	Jasmine	Cuba	1
Alien scale (*Pseudischnaspis alienus* Newst.)	Rose	Florida	1
Ant	Coconut palm	Spanish Honduras	1
Ant	English walnut	England	1
Ant	Yam	Santo Domingo	1
Anthracnose (*Colletotrichum gloeosporioides* Penz.)	Lemon	Italy	1
Anthracnose (*Colletotrichum gloeosporioides* Penz.)	Lime	B. W. Indies	1
Anthracnose (*Colletotrichum gloeosporioides* Penz.)	Mango	Cuba	1
Aphid (*Cerataphis lataniae* (Boisd.))	*Aechmea mariea-reginae*	Argentina	1
Aphid	Chrysanthemum	North Carolina	1
Apple scab (*Venturia inaequalis*)	Apple	England	1
Apple scab (*Venturia inaequalis*)	Apple	Holland	2
Araucaria eriococcus (*Eriococcus araucariae* Mask.)	Norfolk Island pine	Spain	1

*For common and scientific names of Florida scale insects see Quarterly Bulletin, State Plant Board, Vol. VII, No. 4, 1923.

Insect or Disease	Occurring on	From	Number of Shipments Infested
Azalea leaf miner (*Gracilaria azaliella* Brants)	Azalea	Belgium	1
Bag-worm (*Thyridopteryx ephemeraeformis* Haw.)	Plum	Pennsylvania	1
Bamboo scale (*Asterolecanium bambusae* Bdv.)	Bamboo	Florida	1
Black fungus (*Myriangium duriaei*)	Purple scale on orange	Mexico	1
Black scale (*Saissetia oleae* (Bern.))	Avocado	Florida	1
Black scale (*Saissetia oleae* (Bern.))	Citrus	Florida	1
Black scale (*Saissetia oleae* (Bern.))	Hibiscus	Florida	1
Black scale (*Saissetia oleae* (Bern.))	Lemon	Italy	1
Black scale (*Saissetia oleae* (Bern.))	Oleander	Florida	2
Black scale (*Saissetia oleae* (Bern.))	Rose	Santo Domingo	1
Black thread scale (*Ischnaspis longirostris* (Sign.))	Palm	Cuba	2
Blackfly (*Aleurocanthus woglumi* Ashby)	Citrus	Cuba	3
Blackfly (*Aleurocanthus woglumi* Ashby)	Coffee	Cuba	2
Blackfly (*Aleurocanthus woglumi* Ashby)	Gardenia	Cuba	1
Blackfly (*Aleurocanthus woglumi* Ashby)	Lime	Jamaica	1
Blackfly (*Aleurocanthus woglumi* Ashby)	Orange	Jamaica	1
Blackfly egg spirals (*Aleurocanthus woglumi* Ashby)	Orange	Cuba	1
Blotch	Apple	Holland	1
Blotch (*Phyllosticta solitaria* E. & E.)	Apple	Italy	1
Blue mold	Lemon	Louisiana	1
Blue mold	Orange	California	1
Blue mold	Orange	Louisiana	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Blue mold (*Penicillium* sp.)	Orange	Spain	1
Boisduval's scale (*Diaspis boisduvalii* Sign.)	*Aechmea mariea-reginae*	Argentina	1
Boisduval's scale (*Diaspis boisduvalii* Sign.)	Coconut	Bahama Islands	1
Boisduval's scale (*Diaspis boisduvalii* Sign.)	Coconut	Cuba	4
Borer injury (Coleopteron?)	Sugar cane	Cuba	1
Cactus scale (*Diaspis echinocacti* Comst.)	Cactus	Louisiana	1
California red scale (*Chrysomphalus aurantii* (Mask.))	Lemon	Greece	1
Camellia scale (*Lepidosaphes camelliae* Hoke)	Camellia	Louisiana	1
Cardin's whitefly (*Aleurodicus cardini* Back)	Guava	Cuba	1
Cerambycid beetle	Unknown	Cuba	1
Chaff scale (*Parlatoria pergandii* Comst.)	Grapefruit	Louisiana	1
Chaff scale (*Parlatoria pergandii* Comst.)	Grapefruit	Texas	1
Chaff scale (*Parlatoria pergandii* Comst.)	Lemon	Cuba	1
Chaff scale (*Parlatoria pergandii* Comst.)	Lemon	Greece	1
Chaff scale (*Parlatoria pergandii* Comst.)	Lemon	Holland	1
Chaff scale (*Parlatoria pergandii* Comst.)	Lemon	Italy	2
Chaff scale (*Parlatoria pergandii* Comst.)	Orange	Cuba	1
Chaff scale (*Parlatoria pergandii* Comst.)	Orange	Florida	1
Chaff scale (*Parlatoria pergandii* Comst.)	Orange	Mexico	2
Chaff scale (*Parlatoria pergandii* Comst.)	Orange	Spain	5
Chaff scale (*Parlatoria perdandii* Comst.)	Orange	Trinidad	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Cherry scale (*Aspidiotus forbesi* Johnson)	Plum	Pennsylvania	1
Citrus scab (*Cladosporium citri* Massee)	Citrus	Florida	1
Citrus scab (*Cladosporium citri* Massee)	Grapefruit	Mississippi	1
Cloudy-winged white-fly (*Dialeurodes citrifolii* (Morg.))	Citrus	Florida	1
Cloudy-winged white-fly (*Dialeurodes citrifolii* (Morg.))	Grapefruit	Cuba	1
Cloudy-winged white-fly (*Dialeurodes citrifolii* (Morg.))	Orange	Cuba	1
Coconut mealybug (?) (*Pseudococcus nipae* (Mask.)) (?)	Coconut	Jamaica	1
Coconut mealybug (*Pseudococcus nipae* (Mask.))	Palm	Florida	1
Coconut mealybug (*Pseudococcus nipae* (Mask.))	Palms	Santo Domingo	1
Common mealybug (*Pseudococcus citri* (Risso))	Breadfruit	Cuba	1
Common mealybug (*Pseudococcus citri* (Risso))	Chrysanthemums	North Carolina	1
Common mealybug (*Pseudococcus citri* (Risso))	Frangipanni?	Bahama Islands	1
Common mealybug (*Pseudococcus citri* (Risso))	Lime	Dominica, B.W.I.	1
Common mealybug (*Pseudococcus citri* (Risso))	Oleander	Florida	1
Common mealybug (*Pseudococcus citri* (Risso))	Rose	Connecticut	1
Common mealybug (*Pseudococcus citri* (Risso))	Unknown	Florida	1
Common whitefly (*Dialeurodes citri* (Ash.))	Cape jasmine	Alabama	1
Common whitefly (*Dialeurodes citri* (Ash.))	Cape jasmine	Arkansas	1
Common whitefly (*Dialeurodes citri* (Ash.))	Cape jasmine	Florida	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Common whitefly (*Dialeurodes citri* (Ash.))	Cape jasmine	Georgia	1
Common whitefly (*Dialeurodes citri* (Ash.))	Cape jasmine	North Carolina	1
Common whitefly (*Dialeurodes citri* (Ash.))	Cape jasmine	South Carolina	1
Common whitefly (*Dialeurodes citri* (Ash.))	Citrus	Florida	1
Common whitefly (*Dialeurodes citri* (Ash.))	Grapefruit	Florida	1
Common whitefly (*Dialeurodes citri* (Ash.))	Jasmine	Alabama	1
Common whitefly (*Dialeurodes citri* (Ash.))	Holly	South Carolina	1
Common whitefly (*Dialeurodes citri* (Ash.))	Jasmine	Georgia	1
Common whitefly (*Dialeurodes citri* (Ash.))	Ligustrum	Georgia	1
Common whitefly (*Dialeurodes citri* (Ash.))	Orange	Florida	2
Common whitefly (*Dialeurodes citri* (Ash.))	Privet	North Carolina	1
Corn ear worm (*Chloridea obsoleta* (Fab.))	Corn	Bahama Islands	1
Cottony-cushion scale (*Icerya purchasi* Mask.)	Citrus	Florida	1
Cottony-cushion scale (*Icerya purchasi* Mask.)	Lemon	Italy	1
Cottony-cushion scale (*Icerya purchasi* Mask.)	Rose	Florida	1
Crazy ant (*Prenolespis longicornis* Fab.)	Strawberry	Alabama	1
Crown gall (*Bacterium tumefaciens* E. F. S.)	Dracaena	Pennsylvania	1
Crown gall (*Bacterium tumefaciens* E. F. S.)	Rose	Connecticut	1
Crown gall (*Bacterium tumefaciens* E. F. S.)	Rose	New York	2
Crown gall (*Bacterium tumefaciens* E. F. S.)	Rose	Ohio	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Cyanophyllum scale (*Aspidiotus cyanophylli* Sign.)	Magnolia	Louisiana	1
Cyanophyllum scale (*Aspidiotus cyanophylli* Sign.)	Palm	California	1
Cyanophyllum scale (*Aspidiotus cyanophylli* Sign.)	Seed pod	Bahama Islands	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Avocado	Florida	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Banana	Cuba	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Coconut	Bahama Islands	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Coconut	Cuba	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Euonymus	Spain	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Lemon	England	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Lemon	Holland	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Lemon	Italy	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Lemon	Spain	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Ligustrum (?)	Spain	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Orange	Spain	2
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Palm	Florida	2

Insect or Disease	Occurring on	From	Number of Shipments Infested
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Palm	Spain	3
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Pandanus	Florida	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Shattuck (?)	Jamaica	1
Drug store beetle (*Sitodrepa panicea* (Linn.))	Seed	Cuba	1
Elaterid larvae	Dracaena	Pennsylvania	1
English walnut scale (*Aspidiotus juglans-regiae* Comst.)	Holly	South Carolina	1
Fern scale (*Hemichionaspis aspidistrae* (Sign.))	Aspidistra	Texas	1
Fern scale (*Hemichionaspis aspidistrae* (Sign.))	Coconut	Span'h Honduras	1
Fern scale (*Hemichionaspis aspidistrae* (Sign.))	Fern	Pennsylvania	1
Fern scale (*Hemichionaspis aspidistrae* (Sign.))	Palm	Texas	1
Flies (Family Drosophilidae)	Sweet potato	Cuba	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Citrus	Cuba	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Citrus	Florida	2
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Coconut	Florida	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Oleander	Florida	2
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Orange	Africa	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Orange	Cuba	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Orange	Florida	2

Insect or Disease	Occurring on	From	Number of Shipments Infested
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Palm	Argentina	2
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Palm	Florida	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Palm	Indiana	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Pandanus	Florida	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Rose	Florida	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Shattuck (?)	Jamaica	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Sour orange	Cuba	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Tea plant	Louisiana	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Tea plant (?)	Louisiana	1
Florida wax scale (*Ceroplastes floridensis* Comst.)	Citrus	Florida	1
Florida wax scale (*Ceroplastes floridensis* Comst.)	Guava	Florida	1
Florida wax scale (*Ceroplastes floridensis* Comst.)	Mango	Florida	1
Florida whitefly (*Trialeurodes floridensis* (Quaint.))	Avocado	Florida	3
Flower thrips (*Frankliniella tritici bispinosa* (Morg.))	Rose	Cuba	2
Fungus (*Colletotrichum* sp.)	Palms	Santo Domingo	1
Fungus (*Corticium vagum* B. & S.)	Potato	England	1
Fungus (*Corticium vagum* B. & S.)	Potato	Germany	1
Fungus (*Diplodia natalensis*)	Coconut	Cuba	1
Fungus (*Diplodia* sp.)	Coconut	Cuba	1
Fungus (*Fusarium* sp.)	Potato	Algeria	1
Fungus (*Fusarium* sp.)	Potato	Belgium	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Fungus (*Fusarium* sp.)	Potato	Bermuda	1
Fungus (*Fusarium* sp.)	Potato	Brazil	1
Fungus (*Fusarium* sp.)	Potato	Canary Islands	3
Fungus (*Fusarium* sp.)	Potato	Cape Verde Isl.	1
Fungus (*Fusarium* sp.)	Potato	Cuba	1
Fungus (*Fusarium* sp.)	Potato	England	6
Fungus (*Fusarium* sp.)	Potato	France	1
Fungus (*Fusarium* sp.)	Potato	Germany	11
Fungus (*Fusarium* sp.)	Potato	Holland	2
Fungus (*Fusarium* sp.)	Potato	Italy	4
Fungus (*Fusarium* sp.)	Potato	Mexico	2
Fungus (*Fusarium* sp.)	Potato	Scotland	2
Fungus (*Fusarium* sp.)	Potato	Spain	2
Fungus (*Fusarium* sp.)	Sweet potato	Louisiana	1
Fungus (*Gloesporium* sp.)	Papaya	Cuba	1
Fungus (*Glomerella* sp.)	Peach	Illinois	1
Fungus (*Macrosporium* sp.)	Potato	Gibraltar	1
Fungus (*Macrosporium* sp.)	Potato	Greece	1
Fungus (*Macrosporium* sp.)	Potato	Mexico	1
Fungus (*Rhizoctonia* sp.)	Potato	Belgium	3
Fungus (*Rhizoctonia* sp.)	Potato	Brazil	2
Fungus (*Rhizoctonia* sp.)	Potato	Canary Islands	1
Fungus (*Rhizoctonia* sp.)	Potato	Chile	2
Fungus (*Rhizoctonia* sp.)	Potato	England	1
Fungus (*Rhizoctonia* sp.)	Potato	Germany	6
Fungus (*Rhizoctonia* sp.)	Potato	Italy	1
Fungus (*Rhizoctonia* sp.)	Potato	Mexico	1
Fungus (*Rhizoctonia* sp.)	Potato	Norway	1
Fungus (*Rhizoctonia* sp.)	Potato	Spain	1
Fungus (*Rhizoctonia* sp.)	Potato	Wales	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Fungus (?)	Palm	Texas	1
Green scale (*Coccus viridis* (Green))	Jasmine	Cuba	1
Greenhouse orthezia (*Orthezia insignis* Douglas)	Gardenia	Cuba	1
Greenhouse orthezia (*Orthezia insignis* Douglas)	Unknown	Bahama Islands	1
Greenhouse thrips (*Heliothrips haemorrhoidalis* (Bouche))	Ophiopogon	Pennsylvania	1
Greenhouse thrips (*Heliothrips haemorrhoidalis* (Bouche))	Coconut	Porto Rico	1
Hemispherical scale (*Saissetia hemisphaerica* (Targ.))	Fern	Pennsylvania	1
Hemispherical scale (*Saissetia hemisphaerica* (Targ.))	Palm	California	2
Hemispherical scale (*Saissetia hemisphaerica* (Targ.))	Unknown	New York	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Lemon	Africa	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Lemon	Argentina	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Lemon	England	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Lemon	Florida	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Lemon	Germany	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Lemon	Italy	2
Ivy scale (*Aspidiotus hederae* (Vall.))	Lemon	Spain	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Ophiopogon	California	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Palm	Texas	2
Ivy scale (*Aspidiotus hederae* (Vall.))	Rhododendron	North Carolina	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Sago palm	Florida	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Ivy scale *(Aspidiotus hederae* (Vall.))	Holly	South Carolina	1
Larvae *(Diatraea* sp.)	Corn	Bahama Islands	1
Latania scale *(Aspidiotus lataniae* Sign.)	Azalea	Florida	1
Latania scale *(Aspidiotus lataniae* Sign.)	Bay	Bahama Islands	1
Latania scale *(Aspidiotus lataniae* Sign.)	Euonymus	Spain	2
Latania scale *(Aspidiotus lataniae* Sign.)	Loquat	Florida	1
Latania scale *(Aspidiotus lataniae* Sign.)	Palm	Florida	1
Latania scale *(Aspidiotus lataniae* Sign.)	Pecan	Florida	1
Latania scale *(Aspidiotus lataniae* Sign.)	Sugar apple	Cuba	1
Lepidopterous larva	Mango	Grand Cayman	1
Lepidopterous larva	Orange	Mexico	1
Lepidopterous pupa	Birch bark	New Hampshire	1
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Cassava	Span'h Honduras	1
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Coconut	Cuba	2
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Coconut	Florida	1
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Croton	Cuba	1
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Croton	Florida	1
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Hibiscus	Florida	4
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Legume (woody)	Cuba	1
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Palm	Argentina	1
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Palm	Cuba	1
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Palm	Florida	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Sugar apple	Cuba	1
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Unknown legume	Cuba	1
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Wisteria	Florida	1
Liriodendron scale (*Toumeyella liriodendri* (Gmel.))	Magnolia	Florida	1
Long scale (*Lepidosaphes gloverii* (Pack.))	Lemon	Cuba	1
Long scale (*Lepidosaphes gloverii* (Pack.))	Orange	Spain	3
Long-tailed mealybug (*Pseudococcus longispinus* (Targ.))	Acalypha	Florida	1
Long-tailed mealybug (*Pseudococcus longispinus* (Targ.))	Bougainvillea	Florida	1
Long-tailed mealybug (*Pseudococcus longispinus* (Targ.))	Croton	Cuba	1
Long-tailed mealybug (*Pseudococcus longispinus* (Targ.))	Croton	Florida	1
Long-tailed mealybug (*Pseudococcus longispinus* (Targ.))	Dracaena	Pennsylvania	1
Mealybug (?)	Unknown	New York	1
Mealybug	Yam	Santo Domingo	1
Mealybug (*Pseudococcus virgatus* (Ckll.))	Cotton boll	Bahama Islands	1
Mealybug (*Pseudococcus* sp.)	*Muehlenbeckia* sp.	Cuba	1
Mediterranean fruit fly (*Ceratitis capitata* Wied.)	Orange	Spain	1
Melanose (?)	Orange	Canal Zone	1
Melanose (*Phomopsis citri* Fawcett)	Orange	Texas	2
Mimosa scale (*Chrysomphalus mimosae* (Comst.))	Cuban plum	Cuba	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Mimosa scale (*Chrysomphalus mimosae* (Comst.))	Hog plum	Bahama Islands	1
Mining scale (*Howardia biclavis* (Comst.))	Acalypha	Porto Rico	1
Mining scale (*Howardia biclavis* (Comst.))	Jasmine	Cuba	1
Mining scale (*Howardia biclavis* (Comst.))	Sapodilla	Bahama Islands	1
Mite (*Tetranychus* sp.)	Frangipanni (?)	Bahama Islands	1
Monarch butterfly (*Anosia plexippus* Linn.)	Unknown	Cuba	1
Morelos fruit fly (*Anastrepha ludens* (Loew.))	Grapefruit	Mexico	1
Morelos fruit fly (*Anastrepha ludens* (Loew.))	Orange	Mexico	1
Moth (*Aganoptera* sp.)	Spruce	Vermont	1
Moth borer (*Diatraea* sp.)	Sugar cane	Cuba	6
Moth borer injury (*Diatraea* sp.)	Sugar cane	Cuba	7
Moth borer larva (*Diatraea* sp.)	Sugar cane	Cuba	1
Mulberry whitefly (?) (*Tetraleurodes mori* (Quaint.))	Holly	South Carolina	1
Nematode	Potato	Brazil	1
Nematode	Potato	Chile	1
New aphid (*Aphis spiraecola* Patch)	Citrus	Florida	1
Onion thrips (*Thrips tabaci* Lindeman) (?)	Onion	Greece	1
Onion thrips (*Thrips tabaci* Lindeman)	Onion	Spain	1
Oyster-shell scale (*Lepidosaphes ulmi* (Linn.))	Shrub	North Carolina	1
Palmetto scale (*Comstockiella sabalis* (Comst.))	Palm	Florida	1
Palmetto scale (*Comstockiella sabalis* (Comst.))	Sabal palm	Florida	1
Parlatoria-like scale (*Pseudoparlatoria parlatorioides* (Comst.))	Coconut	Span'h Honduras	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Peach tree borer (*Sanninoidea exitiosa* Say) (?)	Peach	Alabama	1
Pineapple mealybug (*Pseudococcus bromeliae* (Bouche))	Pineapple	Cuba	1
Potato tuber moth (*Phthorimaea operculella* Zell.)	Potato	Germany	1
Potato tuber moth (*Phthorimaea operculella* Zell.)	Potato	Island of Malta	1
Predaceous mite (*Cheletia* sp.)	Scale (*Aspidiotus orientalis cocotiphagus* (Marl.)	Bahama Islands	1
Psocid (?)	Lemon	Italy	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Citrus	Cuba	2
Purple scale (*Lepidosaphes beckii* (Newm.))	Grapefruit	Cuba	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Grapefruit	Jamaica	2
Purple scale (*Lepidosaphes beckii* (Newm.))	Grapefruit	Louisiana	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Grapefruit	Mississippi	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Lemon	Argentina	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Lemon	Cuba	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Lemon	Italy	3
Purple scale (*Lepidosaphes beckii* (Newm.))	Lime	Cuba	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Lime	Dominica, B.W.I.	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Lime	Mexico	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Lime	St. Lucia, B.W.I.	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Africa	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Argentina	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Brazil	2
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Canal Zone	2
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Costa Rica	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Cuba	8
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Florida	8
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Jamaica	2
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Louisiana	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Mexico	2
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Spain	5
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Trinidad	2
Purple scale (*Lepidosaphes beckii* (Newm.))	Satsuma	Louisiana	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Shattuck ?	Jamaica	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Sour orange	Cuba	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Tangerine	Belgium	1
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Guava	Cuba	1
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Jamaica apple	Bahama Islands	1
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Oleander	Alabama	2
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Oleander	Bahama Islands	1
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Oleander	Florida	5
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Unknown	Florida	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Putnam's scale (*Aspidiotus ancylus* (Put.))	Peach	South Carolina	1
Putnam's scale (*Aspidiotus ancylus* (Put.))	Unknown	South Carolina	1
Red-banded thrips (*Selenothrips rubrocinctus* (Giard.))	Croton	Cuba	1
Red-banded thrips (*Selenothrips rubrocinctus* (Giard.))	Guava	Florida	1
Red heart (*Colletotrichum falcatum* Sacc.)	Japanese cane	Florida	1
Rind disease (*Melanconium sacchari* Mass.)	Japanese cane	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Althaea	Alabama	1
Root knot (*Heterodera radicicola* (Greef.))	Cassava	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Coral plant	Alabama	1
Root knot (*Heterodera radicicola* (Greef.))	Fig	Alabama	2
Root knot (*Heterodera radicicola* (Greef.))	Fig	California	1
Root knot (*Heterodera radicicola* (Greef.))	Fig	Florida	11
Root knot (*Heterodera radicicola* (Greef.))	Fig	Georgia	6
Root knot (*Heterodera radicicola* (Greef.))	Fig	North Carolina	1
Root knot (*Heterodera radicicola* (Greef.))	Fig	Virginia	1
Root knot (*Heterodera radicicola* (Greef.))	Forsythia	Georgia	1
Root knot (*Heterodera radicicola* (Greef.))	Hibiscus	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Peach	Alabama	1
Root knot (*Heterodera radicicola* (Greef.))	Peach	Florida	2
Root knot (*Heterodera radicicola* (Greef.))	Peach	Georgia	3

Insect or Disease	Occurring on	From	Number of Shipments Infested
Root knot (*Heterodera radicicola* (Greef.))	Plum	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Rose	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Rose	Pennsylvania	1
Root knot (*Heterodera radicicola* (Greef.))	Rose	South Carolina	1
Rose aphid (*Macrosiphum rosae* (Linn.))	Rose	Cuba	3
Rose scale (*Aulacaspis rosae* (Bouche))	Blackberry	Georgia	1
Rose scale (*Aulacaspis rosae* (Bouche))	Raspberry	Georgia	1
Rose scale (*Aulacaspis rosae* (Bouche))	Rose	Florida	2
Rose scale (*Aulacaspis rosae* (Bouche))	Rose	North Carolina	1
Rose scale (*Aulacaspis rosae* (Bouche))	Rose	South Carolina	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Banana	Florida	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Breadfruit	Cuba	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Citrus	Cuba	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Citrus	Florida	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Grapefruit	Jamaica	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Jasmine	Cuba	2
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Lime	St. Lucia, B.W.I.	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Orange	Argentina	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Orange	Cuba	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Orange	Jamaica	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Orange	Mexico	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Orange	Spain	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Palm	Cuba	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Rose	Florida	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Tamarind	Bahama Islands	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Unknown	Cuba	2
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Unknown	Florida	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Apple	Georgia	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Apple	South Carolina	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Fig	Florida	2
San Jose scale (*Aspidiotus perniciosus* Comst.)	Fig	Georgia	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Peach	Alabama	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Peach	Georgia	2

Insect or Disease	Occurring on	From	Number of Shipments Infested
San Jose scale (*Aspidiotus perniciosus* Comst.)	Peach	South Carolina	2
San Jose scale (*Aspidiotus perniciosus* Comst.)	Pear	Alabama	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Pear	Florida	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Pear	Mississippi	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Plum	North Carolina	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Rose	Alabama	2
San Jose scale (*Aspidiotus perniciosus* Comst.)	Rose	South Carolina	3
Scab (*Actinomyces scabies*)	Potato	Argentina	5
Scab (*Actinomyces scabies*)	Potato	Belgium	11
Scab (*Actinomyces scabies*)	Potato	Bermuda	1
Scab (*Actinomyces scabies*)	Potato	Brazil	8
Scab (*Actinomyces scabies*)	Potato	Canary Islands	3
Scab (*Actinomyces scabies*)	Potato	Chile	4
Scab (*Actinomyces scabies*)	Potato	Cuba	2
Scab (*Actinomyces scabies*)	Potato	England	20
Scab (*Actinomyces scabies*)	Potato	France	2
Scab (*Actinomyces scabies*)	Potato	Germany	24
Scab (*Actinomyces scabies*)	Potato	Gibraltar	2
Scab (*Actinomyces scabies*)	Potato	Greece	2
Scab (*Actinomyces scabies*)	Potato	Holland	5

Insect or Disease	Occurring on	From	Number of Shipments Infested
Scab (*Actinomyces scabies*)	Potato	India	1
Scab (*Actinomyces scabies*)	Potato	Italy	10
Scab (*Actinomyces scabies*)	Potato	Louisiana	1
Scab (*Actinomyces scabies*)	Potato	Mexico	5
Scab (*Actinomyces scabies*)	Potato	Norway	1
Scab (*Actinomyces scabies*)	Potato	Scotland	1
Scab (*Actinomyces scabies*)	Potato	Spain	3
Scab (*Actinomyces scabies*)	Potato	Uruguay	1
Scab (*Actinomyces scabies*)	Potato	Wales	1
Scab (*Cladosporium citri* Massee)	Lime	Cuba	1
Scab (*Cladosporium citri* Massee)	Orange	Florida	1
Scale (*Aonidia lauri* (Bouche))	Laurel	Cuba	1
Scale (*Aonidia lauri* (Bouche))	"Laurel" bay	Cuba	1
Scale (*Aspidiotus destructor* Sign.)	Avocado	Florida	1
Scale (*Aspidiotus destructor* Sign.)	Banana	Cuba	3
Scale (*Aspidiotus destructor* Sign.)	Coconut	Cuba	2
Scale (*Aspidiotus destructor* Sign.)	Coconut	Porto Rico	1
Scale (*Aspidiotus destructor* Sign.)	Pandanus	Florida	1
Scale (*Aspidiotus herculeanus* D. & H.)	Hog plum	Bahama Islands	1
Scale (*Aspidiotus orientalis cocotiphagus* Marl.)	Coconut	Bahama Islands	8

Insect or Disease	Occurring on	From	Number of Shipments Infested
Scale (*Aspidiotus orientalis cocotiphagus* Marl.)	Coconut	Cuba	22
Scale (*Aspidiotus orientalis cocotiphagus* Marl.)	Coconut	Florida	3
Scale (*Aspidiotus orientalis cocotiphagus* Marl.)	Coconut	Jamaica	1
Scale (*Aspidiotus orientalis cocotiphagus* Marl.)	Palm	Cuba	1
Scale (*Aspidiotus orientalis cocotiphagus* Marl.)	Sugar apple	Cuba	1
Scale (*Aspidiotus osborni* Newell & Ckll.)	Blueberry	Alabama	1
Scale (*Aspidiotus spinosus* Comst.)	Palm	Argentina	1
Scale (*Aspidiotus* sp.)	Plum	Ohio	1
Scale (*Asterolecanium miliaris longum* (Green))	Bamboo	Cuba	1
Scale (*Diaspis echinocacti* (Bouche))	Cactus	Virgin Islands	1
Scale (*Lepidosaphes crotonis* (Ckll.))	Acalypha	Porto Rico	1
Scale (*Lepidosaphes lasianthi* (Green))	Croton	Santo Domingo	1
Scale (*Orthezia* sp.)	Tamarind	Bahama Islands	1
Scale (*Parlatoria theae* Ckll.)	Maple	Japan	1
Scale (*Parlatoria* sp.)	Lime	Dominica, B.W.I.	1
Scale (*Parlatoria* sp.)	Orange	Bahama Islands	1
Scale (*Parlatoria* sp.)	Orange	Brazil	1
Scale (*Pseudischnaspis alienus* (Newst.))	Jasmine	Cuba	1
Scale (*Saissetia nigra* (Nietn.))	Hibiscus	Florida	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Scale (*Targionia sacchari* (Ckll.))	Sugar cane	Cuba	1
Scale (*Targionia* sp.)	Magnolia	Florida	1
Scale (*Toumeyella* sp.)	Magnolia	Florida	1
Scale (*Toumeyella* sp.)	Magnolia	Louisiana	1
Silver scurf (*Spondylocladium atrovirens)*	Potato	Argentina	2
Silver scurf (*Spondylocladium atrovirens)*	Potato	Belgium	3
Silver scurf (*Spondylocladium atrovirens)*	Potato	Cuba	1
Silver scurf (*Spondylocladium atrovirens)*	Potato	England	6
Silver scurf (*Spondylocladium atrovirens)*	Potato	France	2
Silver scurf (*Spondylocladium atrovirens)*	Potato	Germany	11
Silver scurf (*Spondylocladium atrovirens)*	Potato	Gibraltar	3
Silver scurf (*Spondylocladium atrovirens)*	Potato	Greece	1
Silver scurf (*Spondylocladium atrovirens)*	Potato	Holland	1
Silver scurf (*Spondylocladium atrovirens)*	Potato	Italy	4
Silver scurf (*Spondylocladium atrovirens)*	Potato	Spain	2
Six-spotted mite (*Tetranychus sexmaculatus* Riley)	Rose	Cuba	3
Six-spotted mite (*Tetranychus sexmaculatus* Riley)	Rose	New York	1
Snail	Dracaena	Pennsylvania	1
Snow scale (*Chionaspis citri* Comst.)	Grapefruit	Jamaica	1
Snow scale (*Chionaspis citri* Comst.)	Orange	Spain	1
Soft brown scale (*Coccus hesperidum* (Linn.))	Citrus	Cuba	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Soft brown scale (*Coccus hesperidum* (Linn.))	Euonymus	Spain	1
Soft brown scale (*Coccus hesperidum* (Linn.))	Frangipanni ?	Bahama Islands	1
Soft brown scale (*Coccus hesperidum* (Linn.))	Palm	Florida	1
Soft rot (*Rhyzopus* sp.)	Sweet potato	Louisiana	1
Stem end rot	Orange	Louisiana	1
Strawberry crown borer (*Tyloderma fragariae* Riley)	Strawberry	Alabama	1
Strawberry crown borer (*Tyloderma fragariae* Riley)	Strawberry	Arkansas	1
Sugar cane borer work (*Diatraea* sp.)	Sugar cane	Cuba	1
Sugar cane moth borer (*Diatraea saccharalis crambidoides* (Trote))	Japanese cane	Florida	1
Sweet potato weevil (*Cylas formicarius* Fab.)	Sweet potato	Cuba	4
Sweet potato weevil (*Cylas formicarius* Fab.)	Sweet potato	Florida	1
Sweet potato weevil (*Cylas formicarius* Fab.)	Sweet potato	Louisiana	3
Sweet potato weevil (*Cylas formicarius* Fab.)	Sweet potato	Mexico	1
Termite injury	Sweet potato	Honduras	1
Thrips (*Haplothrips gowdeyi* (Franklin))	Breadfruit	Cuba	1
Thrips (*Haplothrips merrilli* Watson)	Coconut	Cuba	2
Thrips (*Symphyothrips punctatus* H.&W.)	Scales on coconut	Porto Rico	1
Thrips (immature)	Frangipanni ?	Bahama Islands	1
Tuber spot (*Macrosporium* sp.)	Potato	Cuba	1
Weevil (*Calendra linearis* (Hbst.))	Tamarind	Cuba	1
West Indian fruit fly (*Anastrepha fraterculus* Wied.)	Guava	Cuba	1
White peach scale (*Diaspis pentagona* (Targ.))	Peach	Georgia	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
White peach scale *(Diaspis pentagona* (Targ.))	Plum	Florida	1
White peach scale *(Diaspis pentagona* (Targ.))	Tree of Life *(Bryophyllum* sp.)	Jamaica	1
Wire worm injury	Sweet potato	Cuba	1
Wire worm, injury ?	Sweet potato	Cuba	1
Woolly apple aphis *(Schizoneura lanigera* Hause)	Apple	Georgia	1
Yam scale *(Targionia hartii* (Ckll.))	Yam	Cuba	1
Yam scale *(Targionia hartii* (Ckll.))	Yam	Santo Domingo	1
Ziziphus scale *(Parlatoria ziziphus* (Lucas))	Lemon	Florida	1
Ziziphus scale *(Parlatoria ziziphus* (Lucas))	Lemon	Greece	1
Ziziphus scale *(Parlatoria ziziphus* (Lucas))	Lemon	Italy	1
Ziziphus scale *(Parlatoria ziziphus* (Lucas))	Orange	Spain	1

Pests and Diseases Intercepted

In Mail Shipments

For Year Ending June 30, 1925

Insect or Disease	Occurring on	From	Number of Shipments Infested
Ant	Unknown	Florida	1
Aphid	Easter lily	Bermuda	1
Aphid	Oleander	Illinois	1
Aphis sp.	Easter lily	Bermuda	6
Aphis sp.	Easter lily	Georgia	1
Bamboo scale *(Asterolecanium bambusae* Bdv.)	Bamboo	Barbados, B.W.I.	1
Black scale *(Saissetia oleae* (Bern.))	Almond	Cuba	1
Blackfly *(Aleurocanthus woglumi* Ashby)	Citrus	Cuba	1
Chaff scale *(Parlatoria pergandii* Comst.)	Lime	Illinois	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Chalcid (Hymenopterous insect)	Sugar apple	Cuba	1
Cherry scale (*Aspidiotus forbesi* Johnson)	Peach	Tennessee	1
Cherry scale (*Aspidiotus forbesi* Johnson)	Plum (?)	West Virginia	2
Citrus scab (*Cladosporium citri* Massee)	Lime	Illinois	1
Cloudy-winged whitefly (*Dialeurodes citrifolii* (Morg.))	Citrus	Florida	1
Coconut mealybug (*Pseudococcus nipae* (Mask.))	Palm	Illinois	2
Common mealybug (*Pseudococcus citri* (Risso))	Coleus	Ohio	2
Common mealybug (*Pseudococcus citri* (Risso))	Coleus	Pennsylvania	1
Common mealybug (*Pseudococcus citri* (Risso))	Geranium	Pennsylvania	1
Common mealybug (*Pseudococcus citri* (Risso))	Jessamine	Florida	1
Common mealybug (*Pseudococcus citri* (Risso))	Rose	Pennsylvania	3
Common whitefly (*Dialeurodes citri* (Ash.))	Cape jasmine	Florida	1
Common whitefly (*Dialeurodes citri* (Ash.))	Cape jasmine	Georgia	1
Common whitefly (*Dialeurodes citri* (Ash.))	Citrus	Florida	1
Common whitefly (*Dialeurodes citri* (Ash.))	Citrus	South Carolina	1
Common whitefly (*Dialeurodes citri* (Ash.))	Jasmine	Georgia	1
Common whitefly (*Dialeurodes citri* (Ash.))	Orange	Florida	1
Cottony-cushion scale (*Icerya purchasi* Mask.)	Rose	Florida	1
Crown gall (*Bacterium tumefaciens* E. F. S.)	Plum (?)	West Virginia	2

Insect or Disease	Occurring on	From	Number of Shipments Infested
Crown gall (*Bacterium tumefaciens* E. F. S.)	Rose	Pennsylvania	1
Cuban Aschersonia (*Aschersonia cubensis*)	*Lecanium* sp. on orchid	Costa Rica	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Cape jasmine	Florida	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Citrus	Florida	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Ivy	Florida	1
English walnut scale (*Aspidiotus juglans-regiae* Comst.)	Peach	Unknown	1
Fern scale (*Hemichionaspis aspidistrae* (Sign.))	Fern	Florida	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Oleander	Florida	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Rubber	Florida	1
Florida whitefly (*Trialeurodes floridensis* (Quaint.))	Guava	Florida	1
Fungus	Orange	Texas	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Comptie	Florida	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Ivy	District of Columbia	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Oleander	Illinois	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Sago palm	Florida	1
Latania scale (*Aspidiotus lataniae* Sign.)	Antigonon	New Jersey	1
Latania scale (*Aspidiotus lataniae* Sign.)	Fig	Florida	1
Latania scale (*Aspidiotus lataniae* Sign.)	Fig	Georgia	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Latania scale (*Aspidiotus lataniae* Sign.)	Guava	Florida	1
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Hibiscus	Florida	1
Long soft scale (*Coccus elongatus* Sign.)	Rose	Pennsylvania	4
Parlatoria-like scale (*Pseudoparlatoria parlatorioides* (Comst.))	Unknown	Cuba	1
Pine scale (*Chionaspis pinifoliae heterophyllae* Cooley)	Pine	Florida	1
Pineapple scale (*Diaspis bromeliae* (Kern.))	Orchid	Costa Rica	1
Pink bollworm (*Pectinophora gossypiella* (Saunders))	Seed cotton	China	1
Pink bollworm (*Pectinophora gossypiella* (Saunders))	Cotton boll	Cuba	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Citrus	Cuba	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Citrus	Florida	2
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Oleander	Florida	9
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Oleander	Unknown	1
Pyriform scale (*Pulvinaria pyriformis* Ckll.)	Cape jasmine	Florida	1
Red rot (*Colletotrichum falcatum*)	Sugar cane	Cuba	1
Red-headed scale-fungus (*Sphaerostilbe* sp.)	San Jose scale	Unknown	1
Root knot (*Heterodera radicicola* (Greef.))	Coral vine	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Fig	Florida	4

Insect or Disease	Occurring on	From	Number of Shipments Infested
Root knot (*Heterodera radicicola* (Greef.))	Fig	Georgia	1
Root knot (*Heterodera radicicola* (Greef.))	Geranium	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Plumbago	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Rose	Pennsylvania	7
Root knot (*Heterodera radicicola* (Greef.))	Wisteria	Alabama	1
Rose aphid (*Macrosiphum rosae* (Linn.))	Rose	Pennsylvania	2
Rose scale (*Aulacaspis rosae* (Bouche))	Rose	Pennsylvania	1
Rust (*Uromyces caryophyllinus*)	Carnations	Pennsylvania	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Plum	Florida	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Rose	Unknown	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Unknown	Unknown	1
Scale (*Aonidia lauri* (Bouche))	Laurel	Spain	1
Scale (*Aspidiotus destructor* Sign.)	Almond	Cuba	1
Scale (*Aspidiotus spinosus* Comst.)	Rose	Unknown	1
Scale (*Aspidiotus* sp.)	Ivy	Louisiana	1
Scale (*Asterolecanium miliaris longum* (Green))	Bamboo	Barbados, B.W.I.	1
Scale (*Conchaspis angraeci* Ckll.)	Hibiscus	Florida	1
Scale (*Diaspis* sp.) (?)	Orchids	Cuba	1
Scale (*Lecanium* sp.)	Orchid	Costa Rica	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Scale (*Pseudaonidia tesserata* (de Charm))	Unknown vine	Cuba	1
Soft brown scale (*Coccus hesperidum* (Linn.))	Citrus	Florida	1
Soft brown scale (*Coccus hesperidum* (Linn.))	Lime	Illinois	1
Soft brown scale (*Coccus hesperidum* (Linn.))	Oleander	Illinois	1
Soft brown scale (*Coccus hesperidum* (Linn.))	Orange	Florida	1
Soft scale (*Lecanium* sp.)	Antigonon	New Jersey	1
Spinning mite (*Tenuipalpus palmatus* Donn.)	Magnolia	Florida	1
Tea scale (*Fiorinia theae* Green)	Tea plant	Florida	1
White peach scale (*Diaspis pentagona* (Targ.))	Privet	South Carolina	1
White peach scale (*Diaspis pentagona* (Targ.))	Unknown	South Carolina	1
Woolly whitefly (*Aleurothrixus howardi* (Quaint.))	Citrus	Florida	1

PESTS AND DISEASES INTERCEPTED

Shipments by All Means of Transportation Except Parcel Post

Year Ending June 30, 1926

Insect or Disease	Occurring on	From	Number of Shipments Infested
Acuminate scale (*Coccus acuminatus* (Sign.))	Gardenia	Cuba	1
Alien scale (*Pseudischnaspis alienus* Newst.)	"Penequin"	Cuba	1
Alien scale (*Pseudischnaspis alienus* Newst.)	Rose	Florida	1
Alien scale (*Pseudischnaspis alienus* Newst.)	Unknown	Cuba	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Anthracnose (*Colletotrichum gloeosporioides)*	Orange	California	1
Anthracnose (*Colletotrichum gossypii)*	Cotton bolls	Cuba	1
Anthracnose (*Colletotrichum* sp.)	Avocado	Mexico	1
Ants	Sugar cane	Cuba	1
Aphid (*Aphis nerii* Fonsc.)	Oleander	Bahama Islands	1
Argentine ant (*Iridomyrmex humilis* Mayr.)	Pineapple	Louisiana	1
Argentine ant (*Iridomyrmex humilis* Mayr.)	Soil	Alabama	1
Bamboo scale (*Asterolecanium bambusae* Bdv.)	Bamboo	Cuba	1
Beetle grub	Soil about citrus	Cuba	1
Black rot (*Sphaeronema fimbriata)*	Sweet potato	Texas	1
Black melanose	Orange	Cuba	1
Black scale (*Saissetia oleae* (Bern.))	Oleander	Bahama Islands	1
Black scale (*Saissetia oleae* (Bern.))	Oleander	Florida	2
Black scale (*Saissetia oleae* (Bern.))	Orange	Cuba	2
Black scale (*Saissetia oleae* (Bern.))	Pepper tree ?	California	1
Black thread scale (*Ischnaspis longirostris* (Sign.))	Coconut	Santo Domingo	1
Black thread scale (*Ischnaspis longirostris* (Sign.))	Coffee	Cuba	1
Black thread scale (*Ischnaspis longirostris* (Sign.))	Palm	Cuba	1
Blackfly (*Aleurocanthus woglumi* Ashby)	Citrus	Jamaica	1
Blackfly (*Aleurocanthus woglumi* Ashby)	Jasmine	Cuba	1
Blackfly (*Aleurocanthus woglumi* Ashby)	Orange	Cuba	1
Blackfly (*Aleurocanthus woglumi* Ashby)	Sapodilla ?	Bahama Islands	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Blackfly eggs (*Aleurocanthus woglumi* Ashby)	Bougainvillea	Cuba	1
Blackfly eggs (*Aleurocanthus woglumi* Ashby)	Coffee	Cuba	2
Blackfly eggs (*Aleurocanthus woglumi* Ashby)	Unknown	Cuba	1
Blue mold (*Penicillium italiensis)*	Lime	Trinidad	1
Blue mold (*Penicillium italiensis)*	Orange	Trinidad	1
Blue mold (*Penicillium* sp.)	Orange	Panama	1
Blue mold (*Penicillium* sp.)	Orange	Spain	1
Boisduval's scale (*Diaspis boisduvalii* Sign.)	Coconut	Barbados	1
Boisduval's scale (*Diaspis boisduvalii* Sign.)	Coconut	Cuba	3
Boisduval's scale (*Diaspis boisduvalii* Sign.)	Coconut	Trinidad	1
Chaff scale (*Parlatoria pergandii* Comst.)	Grapefruit	Cuba	1
Chaff scale (*Parlatoria pergandii* Comst.)	Grapefruit	Mexico	1
Chaff scale (*Parlatoria pergandii* Comst.)	Grapefruit	West Indies	1
Chaff scale (*Parlatoria pergandii* Comst.)	Lemon	Italy	1
Chaff scale (*Parlatoria pergandii* Comst.)	Lime	Santo Domingo	1
Chaff scale (*Parlatoria pergandii* Comst.)	Orange	Cuba	3
Chaff scale (*Parlatoria pergandii* Comst.)	Orange	France	1
Chaff scale (*Parlatoria pergandii* Comst.)	Orange	Spain	1
Chaff scale (*Parlatoria pergandii* Comst.)	Orange	Trinidad	1
Chaff scale (*Parlatoria pergandii* Comst.)	Tangerine	Cuba	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Chaff scale (*Parlatoria pergandii* Comst.)	Tangerine	Mexico	1
Cloudy-winged white-fly (*Dialeurodes citrifolii* (Morg.))	Orange	Cuba	2
Coconut mealybug (*Pseudococcus nipae* (Mask.))	Palm	District of Columbia	1
Coconut mealybug (*Pseudococcus nipae* (Mask.))	Royal palm	Cuba	1
Coconut mealybug (*Pseudococcus nipae* (Mask.))	Sapodilla	Bahama Islands	1
Coconut mealybug (*Pseudococcus nipae* (Mask.))	Sugar apple ?	Cuba	1
Common scab (*Rhizoctonia* sp.)	Irish potato	Brazil	1
Common mealybug (*Pseudococcus citri* (Risso))	Citrus	Florida	1
Common whitefly (*Dialeurodes citri* (Ash.))	Cape jasmine	Alabama	1
Common whitefly (*Dialeurodes citri* (Ash.))	Cape jasmine	Florida	1
Common whitefly (*Dialeurodes citri* (Ash.))	Citrus	Florida	1
Common whitefly (*Dialeurodes citri* (Ash.))	Jasmine	Georgia	1
Corn ear worm (*Chloridea obsoleta* (Fab.))	Corn	Cuba	1
Corn Silvanus (*Silvanus surinamensis* (Linn.))	Corn	Ecuador	1
Cottony-cushion scale (*Icerya purchasi* Mask.)	Rose	Florida	1
Crown gall (*Bacterium tumefaciens*)	Rose	Illinois	1
Cuban Aschersonia (*Aschersonia cubensis*)	Scale on star apple leaves	Cuba	1
Cyanophyllum scale (*Aspidiotus cyanophylli* Sign.)	Palm	Cuba	1
Destructor scale (*Aspidiotus destructor* Sign.)	Almond	Cuba	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Destructor scale (*Aspidiotus destructor* Sign.)	Coconut	Cuba	8
Destructor scale (*Aspidiotus destructor* Sign.)	Coconut	Santo Domingo	1
Destructor scale (*Aspidiotus destructor* Sign.)	Pandanus	Porto Rico	1
Destructor scale (*Aspidiotus destructor* Sign.)	Royal palm	Cuba	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Coconut	Cuba	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Grapefruit	West Indies	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Lemon	Italy	2
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Oleander	Florida	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Orange	Mexico	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Orange	Spain	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Palm	Massachusetts	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Royal palm	Cuba	1
Dictyospermum scale (*Chrysomphalus dictyospermi* (Morg.))	Shaddock	Grand Cayman	1
Earthworms	Soil about citrus	Cuba	1
Fern scale (*Hemichionaspis aspidistrae* (Sign.))	Aspidistra	Florida	1
Fern scale (*Hemichionaspis aspidistrae* (Sign.))	Aspidistra	New Jersey	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Fern scale (*Hemichionaspis aspidistrae* (Sign.))	Fern	Louisiana	1
Fern scale (*Hemichionaspis aspidistrae* (Sign.))	Ophiopogon	Louisiana	2
Fern scale (*Hemichionaspis aspidistrae* (Sign.))	*Ophiopogon* sp.	Louisiana	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Aspidistra	New Jersey	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Citrus	Florida	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Grapefruit	West Indies	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Lime	Trinidad	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Oleander	Florida	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Orange	Cuba	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Palm	West Indies	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Rose	Florida	1
Florida red scale (*Chrysomphalus aonidum* (Linn.))	Rubber	Louisiana	1
Florida wax scale (*Ceroplastes floridensis* Comst.)	Vincas (?)	Louisiana	1
Flower thrips (*Frankliniella* sp.)	Rose	Cuba	2
Fungus (*Alternaria* sp.)	Potato	Holland	1
Fungus (*Aspergillus* sp.)	Cauliflower	France	1
Fungus (*Colletotrichum gloeosporioides*)	Banana	Cuba	1
Fungus (*Colletotrichum* sp.)	Papaya	Honduras	1
Fungus (*Diplodia* sp.)	Lime	Jamaica	1
Fungus (*Fusarium* sp.)	Cotton bolls	Cuba	1
Fungus (*Fusarium* sp.)	Potato	Algeria	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Fungus (*Fusarium* sp.)	Potato	Argentina	1
Fungus (*Fusarium* sp.)	Potato	Belgium	4
Fungus (*Fusarium* sp.)	Potato	Brazil	4
Fungus (*Fusarium* sp.)	Potato	Canada	2
Fungus (*Fusarium* sp.)	Potato	England	3
Fungus (*Fusarium* sp.)	Potato	France	1
Fungus (*Fusarium* sp.)	Potato	Germany	6
Fungus (*Fusarium* sp.)	Potato	Holland	2
Fungus (*Fusarium* sp.)	Potato	Italy	2
Fungus (*Fusarium* sp.)	Potato	Mexico	2
Fungus (*Fusarium* sp.)	Potato	Panama	1
Fungus (*Fusarium* sp.)	Potato	Venezuela	1
Fungus (*Fusarium* sp.)	Potato	Wales	1
Fungus (*Graphiola phoenicis*)	Palm	Texas	2
Fungus (*Graphiola phoenicis*)	Phoenix palm	Florida	1
Fungus (*Rhizoctonia* sp.)	Potato	Argentina	1
Fungus (*Rhizoctonia* sp.)	Potato	Brazil	1
Fungus (*Rhizoctonia* sp.)	Potato	Belgium	2
Fungus (*Rhizoctonia* sp.)	Potato	England	1
Fungus (*Rhizoctonia* sp.)	Potato	Holland	1
Fungus (*Rhizoctonia* sp.)	Potato	Jamaica	1
Fungus (*Rhizoctonia* sp.)	Potato	Spain	2
Fungus (*Rhizoctonia* sp.)	Potato	Sweden	1
Fungus (*Rhizoctonia* sp.)	Potato	Unknown	1
Fungus (*Rhizopus migricans*)	Banana	Cuba	1
Fungus (*Fusarium* sp.)	Irish potato	Germany	1
Fusarium (*Fusarium* sp.)	Irish potato	Germany	1
Fusarium (*Fusarium* sp.)	Irish potato	Jamaica	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Fusarium (*Fusarium* sp.)	Irish potato	Tunis	1
Fusarium rot (*Fusarium* sp.)	Irish potato	Brazil	1
Fungus (*Macrosporium* sp.)	Potato	England	1
Greedy scale (*Aspidiotus rapax* Comst.)	Orange	California	1
Green mold (*Penicillium* sp.)	Lemon	Brazil	1
Hemispherical scale (*Saissetia hemisphaerica* (Targ.))	Croton	West Indies	1
Ivy scale (*Aspidiotus hederae* (Vall.))	*Asparagus plumosus*	Brazil	1
Ivy scale (*Aspidiotus hederae* (Vall.))	English ivy	Illinois	1
Ivy scale (*Aspidiotus hederae* (Vall.))	Lemon	Italy	4
Ivy scale (*Aspidiotus hederae* (Vall.))	Lemon	Spain	3
Ivy scale (*Aspidiotus hederae* (Vall.))	Palm	West Indies	1
"Jumping bean" (lepidopteron)	Seed	Unknown	1
Latania scale (*Aspidiotus lataniae* Sign.)	Palm	Cuba	1
Latania scale (*Aspidiotus lataniae* Sign.)	Pandanus	Porto Rico	1
Latania scale (*Aspidiotus lataniae* Sign.)	Rose	Florida	2
Late blight (*Phytophthora infestans*)	Potato	Nova Scotia	1
Leaf miner	Orange (fruit)	Trinidad	1
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Cassava cutting	Honduras	1
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Coconut	Cuba	3
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Papaya	Honduras	1
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Royal palm	Cuba	2
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Royal palm seed	Cuba	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Soursop	Honduras	1
Long scale (*Lepidosaphes gloverii* (Pack.))	Grapefruit	Cuba	2
Long scale (*Lepidosaphes gloverii* (Pack.))	Orange	Cuba	2
Long scale (*Lepidosaphes gloverii* (Pack.))	Orange	France	1
Long scale (*Lepidosaphes gloverii* (Pack.))	Orange	Holland	1
Long scale (*Lepidosaphes gloverii* (Pack.))	Orange	Spain	1
Long-tailed mealybug (*Pseudococcus longispinus* (Targ.))	Croton	West Indies	1
Long-tailed mealybug (*Pseudococcus longispinus* (Targ.))	Sapodilla (?)	Bahama Islands	1
Long-tailed mealybug (*Pseudococcus longispinus* (Targ.))	Stephanotus	Bahama Islands	1
Mealybug (*Pseudococcus* sp.)	Sugar cane	Cuba	2
Melanose (*Phomopsis citri* Fawcett)	Citrus	Florida	1
Melanose (*Phomopsis citri* Fawcett)	Grapefruit	Grand Cayman	1
Melanose (*Phomopsis citri* Fawcett)	Grapefruit	Mexico	1
Melanose (*Phomopsis citri* Fawcett)	Orange	Bahama Islands	1
Melanose (*Phomopsis citri* Fawcett)	Lime	Jamaica	1
Mite (*Tetranychus* sp.)	Rose	Cuba	1
Moth (Family Pyraustinae)	Fern	New Jersey	1
Moth borer (*Diatraea saccharalis* var.)	Sugar cane	Cuba	1
Moth borer (*Diatraea* sp.)	Sugar cane	Cuba	5
Moth borer injury (?)	Sugar cane	Mexico	1
Oleander aphid (*Aphis nerii* Fonsc.)	Oleander	Florida	1
Onion thrips (*Thrips tabaci* Lindeman) ?	Onion	Italy	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Oriental scale (*Aspidiotus orientalis cocotiphagus* (Marl.))	Banana	Cuba	1
Oriental scale (*Aspidiotus orientalis cocotiphagus* (Marl.))	Coconut	Cuba	25
Oriental scale (*Aspidiotus orientalis cocotiphagus* (Marl.))	Royal palm	Cuba	1
Oriental scale (*Aspidiotus orientalis cocotiphagus* (Marl.))	Unknown	Bahama Islands	1
Penicillium (*Penicillium* sp.)	Irish potato	Jamaica	1
Pineapple mealybug (*Pseudococcus bromeliae* (Bouche))	Pineapple	Span. Honduras	1
Pink-spotted hawk-moth (*Herse cingulata* Fab.)	Unknown	Jamaica	1
Potato tuber moth (*Phthorimaea operculella* (Zeller))	Potato	Virginia	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Citrus	Cuba	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Citrus	Florida	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Citrus	Jamaica	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Grapefruit	Cuba	9
Purple scale (*Lepidosaphes beckii* (Newm.))	Grapefruit	Grand Cayman	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Grapefruit	Isle of Pines	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Grapefruit	Mexico	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Grapefruit	West Indies	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Lemon	Brazil	2
Purple scale (*Lepidosaphes beckii* (Newm.))	Lemon	Italy	4

Insect or Disease	Occurring on	From	Number of Shipments Infested
Purple scale (*Lepidosaphes beckii* (Newm.))	Lime	Bahama Islands	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Lime	Grand Cayman	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Lime	Santo Domingo	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Lime	Trinidad	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Bahama Islands	3
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	British W. Indies	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	California	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Canal Zone	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Costa Rica	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Cuba	15
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Haiti	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Louisiana	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Mexico	2
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Panama	3
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Spain	2
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange	Trinidad	3
Purple scale (*Lepidosaphes beckii* (Newm.))	Orange (fruit)	Trinidad	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Pomelo	Cuba	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Pomelo	Mexico	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Satsuma orange	Alabama	2

Insect or Disease	Occurring on	From	Number of Shipments Infested
Purple scale (*Lepidosaphes beckii* (Newm.))	Shaddock	Grand Cayman	1
Purple scale (*Lepidosaphes beckii* (Newm.))	Tangerine	Cuba	1
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Oleander	Florida	2
Pyriform scale (*Pulvinaria pyriformis* Ckll.)	Jessamine	Florida	1
Red rot (*Colletotrichum falcatum* Sacc.)	Sugar cane	Honduras	1
Red rot (*Colletotrichum falcatum* Sacc.)	Sugar cane	Mexico	1
Red-headed scale-fungus (*Sphaerostilbe* sp.)	Purple scale on orange	Costa Rica	1
Red-headed scale-fungus (*Sphaerostilbe* sp.)	Purple scale on orange	Cuba	1
Rice weevil (*Calendra oryzae* (Linn.))	Unknown	Cuba	1
Rot (*Fusarium* sp.)	Potato	Wales	1
Root knot (*Heterodera radicicola* (Greef.))	Fig	Alabama	2
Root knot (*Heterodera radicicola* (Greef.))	Fig	Georgia	3
Root knot (*Heterodera radicicola* (Greef.))	Unknown	Georgia	1
Rose aphid (*Macrosiphum rosae* (Linn.))	Rose	Cuba	1
Rose scale (*Aulacaspis rosae* (Bouche))	Rose	New Jersey	1
Rose scale (*Aulacaspis rosae* (Bouche))	Blackberry	Kentucky	1
Rose scale (*Aulacaspis rosae* (Bouche))	Blackberry	North Carolina	1
Rose scale (*Aulacaspis rosae* (Bouche))	Raspberry	South Carolina	1
Rose scale (*Aulacaspis rosae* (Bouche))	Rose	Alabama	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Almond	Cuba	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Banana	Bahama Islands	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Cinnamon	Cuba	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Coconut	Cuba	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Coffee	Cuba	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Coffee	Guatemala	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Grapefruit	Costa Rica	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Grapefruit	West Indies	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Lime	Trinidad	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Orange	Belgium	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Orange	British W. Indies	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Orange	Cuba	2
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Orange	Trinidad	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Royal palm	Cuba	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Sapodilla (?)	Bahama Islands	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Unknown	Bahama Islands	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Unknown	Jamaica	1
Rufous scale (*Pseudaonidia articulatus* (Morg.))	Unknown leaves	Bahama Islands	1
Rust mite (*Eriophyes oleivorus* Ash.)	Orange	Cuba	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Peach	North Carolina	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Rose	Florida	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
San Jose scale (*Aspidiotus perniciosus* Comst.)	Rose	Georgia	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Rose	Kentucky	1
San Jose scale (*Aspidiotus perniciosus* Comst.)	Rose	Maryland	1
Scab (*Actinomyces scabies*)	Potato	Africa	1
Scab (*Actinomyces scabies*)	Potato	Argentina	5
Scab (*Actinomyces scabies*)	Potato	Azores	1
Scab (*Actinomyces scabies*)	Potato	Bahama Islands	1
Scab (*Actinomyces scabies*)	Potato	Belgium	12
Scab (*Actinomyces scabies*)	Potato	Bermuda	1
Scab (*Actinomyces scabies*)	Potato	Brazil	9
Scab (*Actinomyces scabies*)	Potato	Canada	7
Scab (*Actinomyces scabies*)	Potato	Chile	1
Scab (*Actinomyces scabies*)	Potato	Cuba	3
Scab (*Actinomyces scabies*)	Potato	England	16
Scab (*Actinomyces scabies*)	Potato	France	1
Scab (*Actinomyces scabies*)	Potato	Germany	14
Scab (*Actinomyces scabies*)	Potato	Holland	7
Scab (*Actinomyces scabies*)	Potato	Italy	4
Scab (*Actinomyces scabies*)	Potato	Jamaica	1
Scab (*Actinomyces scabies*)	Potato	Mexico	2

Insect or Disease	Occurring on	From	Number of Shipments Infested
Scab (*Actinomyces scabies*)	Potato	Scotland	1
Scab (*Actinomyces scabies*)	Potato	Spain	2
Scab (*Actinomyces scabies*)	Potato	Sweden	1
Scab (*Actinomyces scabies*)	Potato	Trinidad	1
Scab (*Actinomyces scabies*)	Potato	Unknown	1
Scab (*Actinomyces scabies*)	Potato	Venezuela	2
Scab (*Actinomyces scabies*)	Potato	Wales	2
Scab (*Cladosporium citri* Massee)	Citrus	Florida	1
Scab (*Cladosporium citri* Massee)	Grapefruit	Cuba	1
Scab (*Cladosporium citri* Massee)	Grapefruit	Mexico	1
Scab (*Cladosporium citri* Massee)	Lemon	Brazil	2
Scab (*Cladosporium citri* Massee)	Grapefruit	Costa Rica	1
Scab (*Venturia inaequalis*)	Apple	France	1
Scab (*Venturia inaequalis*)	Apple	Italy	1
Scale (*Aonidia lauri* (Bouche))	*Laurus nobilis*	Italy	1
Scale (*Coccus viridis* (Green))	Gardenia	Cuba	1
Scale (*Parlatoria proteus* (Curtis))	Dracaena	West Indies	1
Scale (*Parlatoria proteus* (Curtis))	Palm	West Indies	1
Scale (*Parlatoria* sp.)	Lime	Alabama	1
Scale (*Parlatoria* sp.)	Lime	Trinidad	1
Silver scurf	Lemon	Bahama Islands	1
Silver scurf	Lime	Bahama Islands	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Silver scurf (*Spondylocladium atrovirens*)	Irish potato	Belgium	2
Silver scurf (*Spondylocladium atrovirens*)	Irish potato	Tunis	1
Silver scurf (*Spondylocladium atrovirens*)	Potato	Algeria	1
Silver scurf (*Spondylocladium atrovirens*)	Potato	Argentina	1
Silver scurf (*Spondylocladium atrovirens*)	Potato	Austria	1
Silver scurf (*Spondylocladium atrovirens*)	Potato	Azores	1
Silver scurf (*Spondylocladium atrovirens*)	Potato	Belgium	6
Silver scurf (*Spondylocladium atrovirens*)	Potato	Bermuda	1
Silver scurf (*Spondylocladium atrovirens*)	Potato	Brazil	2
Silver scurf (*Spondylocladium atrovirens*)	Potato	Canada	1
Silver scurf (*Spondylocladium atrovirens*)	Potato	Cuba	2
Silver scurf (*Spondylocladium atrovirens*)	Potato	England	10
Silver scurf (*Spondylocladium atrovirens*)	Potato	Germany	3
Silver scurf (*Spondylocladium atrovirens*)	Potato	Holland	1
Silver scurf (*Spondylocladium atrovirens*)	Potato	Italy	5
Silver scurf (*Spondylocladium atrovirens*)	Potato	Mexico	1
Silver scurf (*Spondylocladium atrovirens*)	Potato	Spain	6
Silver scurf (*Spondylocladium atrovirens*)	Potato	Sweden	1
Silver scurf (*Spondylocladium atrovirens*)	Potato	Venezuela	1
Snow scale (*Chionaspis citri* Comst.)	Grapefruit	Costa Rica	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Snow scale (*Chionaspis citri* Comst.)	Orange	Belgium	1
Soft brown scale (*Coccus hesperidum* (Linn.))	Citrus	Florida	1
Soft brown scale (*Coccus hesperidum* (Linn.))	Oleander	Missouri	1
Soft rot (*Penicillium* sp.)	Apple	Spain	1
Spindle tuber	Potato	Belgium	1
Stellate scale (*Vinsonia stellifera* (Westw.))	Banana	Bahama Islands	1
Stellate scale (*Vinsonia stellifera* (Westw.))	Sapodilla (?)	Bahama Islands	1
Sugar cane borer (*Diatraea* sp.)	Sugar cane	Cuba	1
Sweet potato weevil (*Cylas formicarius* (Fab.))	Sweet potato	Bahama Islands	1
Sweet potato weevil (*Cylas formicarius* (Fab.))	Sweet potato	Cuba	2
Sweet potato weevil (*Cylas formicarius* (Fab.))	Sweet potato	Grand Cayman	1
Sweet potato weevil (*Cylas formicarius* (Fab.))	Sweet potato	Louisiana	2
Sweet potato weevil (*Cylas formicarius* (Fab.))	Sweet potato	Texas	6
Thrips (*Aleurodothrips fasciapennis* Franklin)	*Aspidiotus orientalis cocotiphagus* (Marl.) on coconut	Cuba	1
Thrips (*Aleurodothrips fasciapennis* Franklin)	Coconut	Trinidad	1
Thrips (*Cephalothrips merrilli* Watson)	*Aspidiotus orientalis cocotiphagus* (Marl.) on coconut	Cuba	1
Tuber spotting (*Alternaria* sp.)	Potato	Mexico	1
Wax scale (*Ceroplastes* sp.)	Jasmine	Cuba	1
Weevil (*Euscepes* sp.)	Sweet potato	Brazil	1
West Indian fruit fly (*Anastrepha fraterculus* Wied.)	Guava	Cuba	1
Whitefly (*Aleyrodes lauri* Sign.) (?)	*Laurus nobilis*	Italy	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Withertip (*Colletotrichum gloeosporioides* Penz.)	Citrus	Florida	1
Withertip (*Colletotrichum gloeosporioides* Penz.)	Lime	Barbados	1
Woolly whitefly (*Aleurothrixus howardi* (Quaint.))	Orange	Cuba	1
Woolly whitefly (*Aleurothrixus howardi* (Quaint.))	Unknown	Bahama Islands	1

Pests and Diseases Intercepted

Shipments by Means of Parcel Post
Year Ending June 30, 1926

Insect or Disease	Occurring on	From	Number of Shipments Infested
Aphid (*Aphis* sp.)	Chrysanthemum	Pennsylvania	1
Aphid (*Aphis* sp.)	Lily	Bermuda	1
Aphid (*Rhopalosiphum* sp.)	Chrysanthemum	Pennsylvania	5
Blackfly (*Aleurocanthus woglumi* Ashby)	Citrus	Cuba	2
Carnation rust (*Uromyces caryophyllinus*)	Carnation	Pennsylvania	9
Chaff scale (*Parlatoria pergandii* Comst.)	Lime	Mexico	1
Chrysanthemum midge (*Diarthronomyia hypogaea* Loew.)	Chrysanthemum	Pennsylvania	16
Common fungus (*Verticillium heterocladum*)	Common whitefly on jessamine	Georgia	1
Common whitefly (*Dialeurodes citri* (Ash.))	Citrus	Florida	1
Common whitefly (*Dialeurodes citri* (Ash.))	Jessamine	Georgia	1
Common whitefly (*Dialeurodes citri* (Ash.))	Orange	Florida	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Convergent ladybeetle *(Hippodamia convergens* Guer.)	Chrysanthemum	Georgia	1
Cottony-cushion scale *(Icerya purchasi* Mask.)	Acalypha	Florida	1
Cottony-cushion scale *(Icerya purchasi* Mask.)	Pecan	Florida	1
Crown gall *(Bacterium tumefaciens)*	Lantana	Pennsylvania	1
Crown gall *(Bacterium tumefaciens)*	Rose	Florida	1
Dictyospermum scale *(Chrysomphalus dictyospermi* (Morg.))	Camphor	Florida	1
Dictyospermum scale *(Chrysomphalus dictyospermi* (Morg.))	Oleander	Florida	1
Dictyospermum scale *(Chrysomphalus dictyospermi* (Morg.))	Orange	Florida	1
Fern scale *(Hemichionaspis aspidistrae* (Sign.))	Fern	Ohio	1
Fern scale *(Hemichionaspis aspidistrae* (Sign.))	Fern	Pennsylvania	2
Florida red scale *(Chrysomphalus aonidum* (Linn.))	Oleander	Florida	1
Florida red scale *(Chrysomphalus aonidum* (Linn.))	Succulent plant	Florida	1
Hemispherical scale *(Saissetia hemisphaerica* (Targ.))	Fern	Ohio	1
Ivy scale *(Aspidiotus hederae* (Vall.))	Ivy	Florida	1
Latania scale *(Aspidiotus lataniae* Sign.)	Fig	Florida	1
Latania scale *(Aspidiotus lataniae* Sign.)	Jasmine	Florida	1
Latania scale *(Aspidiotus lataniae* Sign.)	Sapota	Mexico	1
Lesser snow scale *(Hemichionaspis minor* (Mask.))	Hibiscus	Florida	2

Insect or Disease	Occurring on	From	Number of Shipments Infested
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Palm	Florida	1
Lesser snow scale (*Hemichionaspis minor* (Mask.))	Succulent plant	Florida	1
Mite (?)	Dasheen	Florida	1
Mulberry whitefly (*Tetraleurodes mori* (Quaint.))	Guava	Florida	1
Palmetto scale (*Comstockiella sabalis* (Comst.))	Palmetto	Florida	1
Purple scale (*Lepidosaphes beckii* (Newman))	Lemon	Italy	1
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Geranium	Florida	1
Pustule scale (*Asterolecanium pustulans* (Ckll.))	Oleander	Florida	6
Pyriform scale (*Pulvinaria pyriformis* Ckll.)	Guava	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Clematis	Pennsylvania	1
Root knot (*Heterodera radicicola* (Greef.))	Coleus	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Fig	Florida	3
Root knot (*Heterodera radicicola* (Greef.))	Geranium	Pennsylvania	1
Root knot (*Heterodera radicicola* (Greef.))	Peach	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Pecan	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Rose	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Rose	Pennsylvania	9
Root knot (*Heterodera radicicola* (Greef.))	Unknown	Florida	1
Root knot (*Heterodera radicicola* (Greef.))	Weigela	Pennsylvania	2
Rose scale (*Aulacaspis rosae* (Bouche))	Rose	Florida	1

Insect or Disease	Occurring on	From	Number of Shipments Infested
Royal palm bug (*Xylastodoris luteolus* Barber)	Royal palm	Cuba	1
Rust (*Physopella fici* (Cost.) Arth.)	Fig	Cuba	1
Scab (*Cladosporium citri* Massee)	Citrus	Florida	2
Scab (*Venturia inaequalis)*	Apple	Denmark	3
Scale (*Aspidiotus orientalis cocotiphagus* (Marl.))	Coconut	Cuba	1
Soft brown scale (*Coccus hesperidum* (Linn.))	Oleander	Florida	1
Tea scale (*Fiorinia theae* Green)	Japonica	Georgia	1
Withertip (*Colletotrichum gloeosporioides* (Penz.))	Lime	Mexico	1

THE QUARTERLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

WILMON NEWELL, *Plant Commissioner*............*Editor*

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O. F. BURGER............*Plant Pathologist*

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

DEPARTMENT OF CITRUS CANKER ERADICATION

REPORT ON ERADICATION WORK IN COOPERATION WITH THE BUREAU OF PLANT INDUSTRY, UNITED STATES DEPARTMENT OF AGRICULTURE, FOR QUARTER ENDING DECEMBER 31, 1926.

Citrus grove trees inspected	2,108,944
Citrus nursery trees inspected	29,242,425
Inspectors employed on citrus canker eradication	30
New properties showing active infection	1
Total properties showing active infection	1
Grove trees found infected	2
Nursery trees found infected	0
Counties in which active infections were found	1

GENERAL SUMMARY

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15,158
Nursery trees found infected since May, 1914	342,260
Number properties found infected to December 31, 1926	513
Properties declared no longer "danger centers"	512*
Properties still classed as actively infected December 31, 1926	1

*Two of the formerly actively infected properties are still resting under certain restrictions, which apply direct to these properties but do not affect adjoining or contiguous properties. These restrictions refer to methods of cultivation, etc.

Department of Citrus Canker Eradication (Report Continued

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to Dec. 31, 1926.

1914		1915		1916		1917		1918		1919		1920	
Jan.		Jan.	306	Jan.	86	Jan.	14	Jan.	0	Jan.	0	Jan.	0
Feb.		Feb.	165	Feb.	21	Feb.	4	Feb.	1	Feb.	0	Feb.	0
Mar.		Mar.	444	Mar.	49	Mar.	9	Mar.	1	Mar.	1	Mar.	0
Apr.		Apr.	408	Apr.	49	Apr.	169	Apr.	2	Apr.	1	Apr.	0
May	108	May	1042	May	338	May	52	May	1	May	1	May	0
Jun.	160	Jun.	772	Jun.	450	Jun.	45	Jun.	10	Jun.	0	Jun.	0
Jul.	275	Jul.	651	Jul.	349	Jul.	39	Jul.	0	Jul.	0	Jul.	539
Aug.	1318	Aug.	1345	Aug.	219	Aug.	30	Aug.	0	Aug.	1	Aug.	1
Sep.	767	Sep.	618	Sep.	124	Sep.	6	Sep.	0	Sep.	0	Sep.	0
Oct.	565	Oct.	214	Oct.	451	Oct.	2	Oct.	0	Oct.	0	Oct.	0
Nov.	773	Nov.	494	Nov.	131	Nov.	1	Nov.	0	Nov.	0	Nov.	0
Dec.	366	Dec.	256	Dec.	27	Dec.	1	Dec.	0	Dec.	0	Dec.	0
Total	4327	Total	6715	Total	2294	Total	372	Total	15	Total	4	Total	540

1921		1922		1923		1924		1925		1926	
Jan.	0	Jan.	0	Jan.	1	Jan.	0	Jan.	0	Jan.	0
Feb.	0	Feb.	0	Feb.	1	Feb.	0	Feb.	0	Feb.	0
Mar.	0	Mar.	0	Mar.	2	Mar.	0	Mar.	5	Mar.	0
Apr.	0	Apr.	0	Apr.	3	Apr.	0	Apr.	0	Apr.	0
May	0	May	585	May	2	Mry	0	May	0	May	0
Jun.	0	Jun.	168	Jun.	1	Jun.	0	Jun.	0	June	0
July	0	Jul.	28	Jul.	0	Jul.	0	Jul.	0	July	0
Aug.	0	Aug.	34	Aug.	0	Aug.	0	Aug.	0	Aug	0
Sep.	0	Sep.	23	Sep.	0	Sept.	0	Sep.	0	Sept	0
Oct.	0	Oct.	19	Oct.	1	Oct.	0	Oct.	0	Oct.	0
Nov.	0	Nov.	12	Nov.	0	Nov.	0	Nov.	0	Nov.	0
Dec.	0	Dec.	4	Dec.	0	Dec.	0	Dec	0	Dec.	2
Total	0	Total	873	Total	11	Total	0	Total	5	Total	2

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S QUARTERLY SUMMARY
QUARTER ENDING DECEMBER 31, 1926

SHIPS AND VESSELS INSPECTED:			
From Foreign Ports—			
Direct	610		
Via U. S. Ports	93		
Total		703	
From U. S. Ports other than Florida		562	
From Florida Ports		157	
Total			1,422
NUMBER OF PARCELS INSPECTED:			
Arriving by water—			
Passed		156,042	
Treated and passed		237,034	
Returned to shipper		1,165	
Contraband destroyed		322	
Total			394,563
Arriving by land—Express, Freight, Wagon, etc.:			
Passed		666	
Treated and passed		308	
Returned to shipper		104	
Contraband destroyed		67	
Total			1,145
Arriving by Mail—			
Passed		346½	
Treated and passed		4	
Returned to shipper		1	
Contraband destroyed		11½	
Total			363
GRAND TOTAL OF PARCELS INSPECTED			396,071
Number of parcels on hand pending determination as to final disposition		17	

BEE DISEASE ERADICATION

REPORT FOR QUARTER ENDING DECEMBER 31, 1926

Number of apiaries inspected	156
Number of colonies inspected	3,316
Number of apiaries infected with American foul brood	1
Number of colonies infected with American foul brood	2
Number of apiaries infected with European foul brood	0
Number of colonies infected with European foul brood	0

THE QUARTERLY BULLETIN

State Plant Board of Florida

Vol. XI April, 1927 No. 3

THE FLORIDA POTATO PLANT-BUG

By F. H. CHITTENDEN, Bureau of Entomology

While working in central Florida the late H. M. Russell collected and observed the habits of *Corecoris diffusus* Say,[1] a large plant-bug of striking appearance (Fig. 1). Observations were made at Orlando in 1907 when the bugs were feeding on potato and a wild Solanum, by sucking out the plant juices in the characteristic manner of the coreid family. Adults and the last two stages were also attacking a leaf of canna. Adults, many nymphs in the fifth stage, and one in the fourth and one in the third, were observed until August 4. All that came under observation had transformed to adults by August 13.

July 24, 1908, this species was again observed at Orlando, Florida, on wild Solanum, eggs, young, and adults being present. August 3, the last nymph matured. February 4, 1909, specimens were received from Cutler, Florida, on wild mustard. May 31, 1910, E. R. Sasscer, Bureau of Entomology, while at Miami, Florida, collected all stages except the egg on wild Solanum. He described them as literally swarming on this plant. June 1, 1921, J. H. Heard, Lake Como, Florida, complained of an insect injuring his potato vines, stating that it was difficult to capture, since the insects flew readily. It was of a golden color and occurred also on tomato vines. July 4 he sent specimens, including adults and nymphs, stating that the hills of potatoes on which they occurred were non-productive, while those which were not affected produced potatoes.

DESCRIPTIVE

THE ADULT

Corecoris diffusus (Fig. 1) is one of the largest forms of plant-bugs inhabiting the United States, measuring six-eighths

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[1]Family Coreidae; suborder Heteroptera.

[2]Note: Although this account is not complete, its publication seems advisable as its subject is one of the many insects injurious to potato, our principal vegetable food-plant. Some of the observations were made by Russell. The related *Corecoris batatas* Fab., according to E. G. Smith, is an enemy of eggplant and other Solanaceae in Porto Rico.

to seven-eighths of an inch in length. It is tawny yellow and the thorax bears two slightly oblique, longitudinal lines. The connexivum projects strongly from the hemelytra or upper wings, and the abdominal segments are well separated, and strongly marked somewhat as in certain turtles. The eyes are red and very small, and the antennae are thick, black and strongly pubescent. The legs are unarmed, and each abdominal segment shows on each side a conspicuous breathing pore, round and hollow. The original description by Say is as follows:

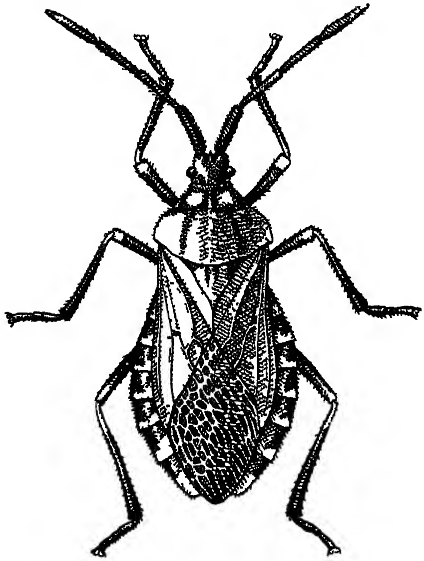

Fig. 1.—*Corecoris diffusus*, adult. Enlarged. (Original.)

"2. *C. (oreus) diffusus.*—Brownish; abdomen dilated; antennae and feet blackish.

Inhabits Georgia.

Body depressed pale yellowish-brown; with short hairs; dilated; head unarmed, the middle of the tip not reaching the base of the first joint of the antennae; antennae blackish, hairs very obvious; basal joint a little excurved; second joint a little longer than the third; thorax somewhat transversely punctured; lateral edge irregularly denticulated, particularly anteriorly; posterior angles very obtusely rounded; scutel black in the middle; hemelytra immaculate: corium finely reticulate; the disks of the basal cellules blackish: abdomen dilated; margin elevated and with a series of black points on the edge; feet blackish piceous.

Length seven-tenths of an inch."

THE EGG AND OVIPOSITION

Eggs were observed hatching February 4, August 19 and 20, and were laid in clusters of 8 to 10, similar to those of squash

SAY, THOMAS—Description of new species of Heteropterous Hemiptera of North America, New Harmony, Ind., p. 770, 1831. (LeConte edition. Vol. I, p. 325, 1859). Original description as *Coreus diffusus* from Georgia; near Savannah.

This insect is figured and listed as *Spartocerus* (Burm.) *fuscus* Thunb. *Coreus diffusus* Say (var.), by Townsend Glover, in Manuscript notes from my Journal, Order Hemiptera, etc., p. 68, Plate VIII, fig. 33, 1876.

C. diffusus Say is similar to *C. fuscus* Thunb., and, according to Van Duzee, may not be distinct.

bugs (Anasa). Smaller masses were laid closely together, in three rows of 3, 4 and 5. Egg masses were deposited on the lower side of leaves of mustard and cucumber, May, 1907.

The egg is similar to that of Anasa, flattened on the sides; color light bronzy testaceous, surface beautifully sculptured with delicate and minute hexagonal figures; form oval with quite pointed ends and one side bulging; base of cap defined by a row of very brown spots.

Length 2 mm.; width nearly 1.5 mm.

THE NYMPH

First Stage.—Description made when the nymph was less than a day old. Body bright vermilion. Antennae black with intersections pink, haustellum pink, body and appendages with short black hairs. Head, vermilion; eyes dark red; antennae and legs subequal, about the same length as the body. Antennae 4-jointed, joints subcylindrical; 1 widest, 2 and 3 same width; 4 fusiform, wider than first segment; first with basal half vermilion. Antennae and legs quite densely covered with black hairy pubescence. Body elongate suboval, head subtriangular, end of abdomen well rounded, edges upturned and center of abdomen with 2 dorsal rounded tubercles. Coxae, trochanter and basal half of femur vermilion.

Length of body 3 mm., width at thorax 1 mm., width at middle of abdomen 1.5 mm., width of head 0.7 mm.

August 22, the nymph was about 3.75 mm. long; it molted late in the afternoon. August 24, at 9 A.M., about the same, but longer and plumper. Length of first stage 5 to 6 days.

Second Stage.—Appearance similar to first stage but with tubercles and reflexed edges of the abdomen more prominent and scalloped. Head with front somewhat truncate, not so nearly triangular, color unchanged, tip of haustellum black, eyes more prominent on sides, antennae longer but of same shape and color. Thorax changed to pink, lighter than remainder of body. Legs same color, shining black. Abdomen almost rounded, color still vermilion but ornamented with 5 pairs of triangular black spots on the edges, increasing in size posteriorly and with tubercles edged with black on each side. Abdomen tilted upward.

Length 3.75 mm.; width of abdomen 1.7 mm.

Third and fourth stages not described.

Fifth Stage.—Shape nearly pyriform; color tawny yellow;

thorax, pronotum and scutellum strongly marked with black through middle two-thirds, leaving a small yellow rounded area each side of median line and a larger one at base. Hemelytra nearly as long as abdominal segment (in dried specimens) bordered with heavy black lines; connexivum wide, projecting, upturned, ornamented with transverse black bars similar to adult; interior portion dull brown, antennae black, femora brownish near middle, posterior femora darker, tibiae and tarsi dull brownish black.

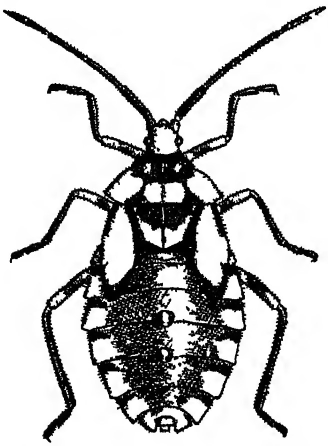

Fig. 2. — *Corecoris diffusus*, fifth or last nymphal stage. Enlarged. (Original.)

Length 11 mm.; width 7.5 mm.

HISTORY

The first mention of the injurious habits of this species known was made by Dr. E. A. Schwarz, who found it at Lake Worth, Florida, puncturing the ripening fruit of tomato, in company with *Phthia picta* Drury, but only in the "larval and pupal" stages. The two species share a common wild food plant, apparently *Solanum nigrum*. He expressed the belief that it was by means of this plant that the two species mentioned had been enabled to gain a foothold in Florida and to spread from place to place, both insects having obviously migrated from the West Indies into Florida. Even at that time their advancement was slow and has remained much the same to the present.

There is also an unpublished note in regard to this species being found on the same Solanum, made by Professor J. H. Comstock, March 1, 1880. He observed the adult and nymphs of the last stage at Rock Ledge, Florida, and stated that the insect was known to some as the "bloodsucker". Later, specimens were received from Mr. J. M. Lever Waldo, Palm Beach, Florida, with a statement that they did great damage to the leaves of grape.

Proc. Ent. Soc. Wash., vol. I, p. 224, May, 1889.

NOTES ON SOME INSECTS OCCURRING ON THE ISLAND OF NEW PROVIDENCE, BAHAMA ARCHIPELAGO, AND THEIR BEARING ON HORTICULTURE IN FLORIDA

G. F. Moznette

During the spring of 1923, while the writer was stationed at Miami, Florida, investigating insects of various tropical fruits, a portion of a month was spent on New Providence, an island of the Bahama Archipelago, in quest of parasites and predators of the papaya fruit fly, *Toxotrypana curvicauda* Gerst. This fruit fly is present and destructive to the papaya *(Carica papaya)* in southern Florida, breeding freely without the intervention of a parasite or predatory enemy. Incidentally, in scouting, a number of observations were made on the prevalence of a few other insects; for example, insects of such tropical fruits as the avocado, mango, guava, sapodilla, as well as others growing on the Island.

Plantings of papayas in regular orchard form do not exist on the Island of New Providence. Papayas are either growing wild in the tropical thickets or in door yards of the native settlements. Sections of the Island which were visited may be divided as follows: western end in the vicinity of Charlotte Ville and Lake Cunningham, the region about Nassau, the eastern end of the Island and the southern side in the neighborhood of the town of Carmichael. Large quantities of material of the various stages of the papaya fruit fly were gathered in each of these sections, and careful examinations made. Breeding cages were set up at Nassau, where headquarters were established. In every case where quantities of the pupae (resting stage) were gathered and placed in breeding cages, the flies emerged unhindered with no signs of parasitic intervention. The numerous larvae which were obtained and examined produced no parasites. Adults captured in the field were free from parasites, and eggs which were obtained from fruits also did not produce beneficial forms. During the search no predatory forms were obtained of either the larval or pupal stages. Investigations showed that the papaya fruit fly is as serious a pest in sections about New Providence as it is in southern Florida.

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Most of the papaya plants found were growing in small pot holes of soil in the rocky formation and attain an enormous height without any fertilizer being applied. The virgin soil is very rich and in most places consists of the Bahamian red and brown loams. Papaya plants were seen which had attained a height equal to that of the tallest palmettos and nearly a foot in diameter at the base.

Practically all the avocados growing on the Island are of the West Indian types which for the most part are growing in the native settlements. A few Guatemalan varieties have been introduced and are growing in several small orchard plantings. In some of these orchard plantings avocados are doing well, being planted in pot holes in the seemingly solid rock formation. No regular plantings of any other tropical fruit are present, and such tropical fruits as mangoes, sapodillas and guavas are being grown in door yards and along the roads.

The following insects were found infesting the avocado: *Trialevrodes floridensis* Q.; *Empoasca minuenda* Ball; *Frankliniella cephalica* Craw.; *Pseudococcus nipae* Mask.; *Chrysomphalus dictyospermi* Morgan; *Aleurocanthus woglumi* Ashby; *Gracilaria perseae* Busck and *Heliothrips hemorrhoidalis* Bouché. At this time a few predatory enemies were observed on some of these pests. In each case these were species recognized as already existing in Florida, as *Scymnus utilis* Horn, etc.

Mangoes for the most part are those of the Bombay, Cambodiana, No. Eleven and Turpentine groups. Some of the insects found on the mango were the following: *Vinsonia stellifera* Westw.; *Coccus acuminatus* Sign.; *Heliothrips rubrocinctus* Giard.; *Aleurocanthus woglumi* Ashby. A careful search was made of mango fruits to see if the West Indian fruit fly, *Anastrepha fraterculus* Wied., was present. The writer was unable to find this pest on the Island.

Other insects found on other fruits were the glossy star scale, *Vinsonia stellifera*, on sapodilla; *Coccus acuminatus* Sign. and *Chrysomphalus dictyospermi* Morgan on breadfruit. No doubt others are present on all the above fruits, but only the more apparently abundant species were observed at the time.

The most important pest on the Island to tropical plants is the black fly, *Aleurocanthus woglumi* Ashby, and one which fortunately does not occur in Florida. During the brief stay on the Island the following plants were found infested and hosts of the species: citrus (limes, grapefruit, orange and Berga-

mot *(Labiatae)*; mango, sapodilla, avocado, *Annona* sp., soursop; banana and *Cryptostegia grandiflora* (Asclepiadaceae). The writer visited many remote places in the course of his survey. In some of these places deserted estates were found, where at one time fine citrus plantings had been maintained. In every instance, where citrus trees were examined, the black fly was present attacking the new sprouts or suckers arising from the slowly dying branches which were struggling for existence. In the native settlements where many fine citrus trees were once present only mere remains of the trees now exist because of the work of this pest. In fact, the black fly has practically ruined the citrus industry. Nothing is or has been done in the way of control and a power sprayer is not to be seen. The writer was told by the Secretary of Agriculture that before the advent of the black fly, trees grew luxuriantly and produced splendid fruit. It was also learned from good authorities in Nassau that the black fly has already spread to a number of adjacent islands, including Eleuthera Cay, at which place it is present in the vicinity of Spanish Wells where grapefruit is being grown. It will be just a question of time when the black fly will be present throughout the Islands.

Next to citrus the mango is apparently the favorite host on the Island. However, some mango varieties appeared to be immune, growing in close proximity to infested varieties.

A plant scientifically known as *Cryptostegia grandiflora* was found to be badly infested with the black fly in the vicinity of Charlotte Ville. This is of interest, since at the present time *Cryptostegia grandiflora* is being tested out in Florida as a possible source of rubber production. It is a plant producing a high grade of rubber and apparently does well in southern Florida.

Altho the writer was unsuccessful in obtaining a parasite or predatory enemy of the papaya fruit fly, these few notes may interest those who in the future contemplate investigations on the Island of New Providence. Furthermore, while the avocado, mango and other tropical fruits are forming the basis of an important fruit industry together with the citrus industry in Florida, it is essential that we should know as much as possible concerning injurious insects attacking these fruits occurring in the various exotic regions.

THE QUARTERLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

"PLANT QUARANTINE INSPECTION—SOME WHYS AND WHEREFORES"

Many people who are not entirely familiar with plant quarantine activities may sometimes wonder what is being accomplished by state and federal governments in exercising scrupulous care to prevent the introduction into this country of dangerous plant pests. It is a well recognized fact that we already have pests which are exacting an enormous toll from agriculturists annually. It is equally well recognized that money expended in preventing introduction of additional pests is money well expended. The average agriculturist, however, appears to be well content with this information, seeming to feel that it is not his business particularly, but rather the business of the men who are employed to keep the pests out. This is an unfortunate situation and whilst it might be regarded by the officials as complimentary, in a sense, yet it shows an unsatisfactory attitude upon the part of the public which is being benefited and which should be deeply interested in everything pertaining to quarantine activities.

Occasionally an incident of startling importance arouses the otherwise slumbering agricultural population to the fact that there is work being done and much more to be done and that the defenses of the country should be strengthened. Here in Florida it required an impending catastrophe—citrus canker—to bring agriculturists to the realization that protection was needed. This was in 1915. Since that time the plant protective organization in Florida has been functioning efficiently and has been well supported by the agriculturists of the state. The attitude, as has been previously set forth, is one, however, which seems to be that of satisfaction and content rather than of interest and continued concern.

A recent occurrence in California is set forth in an editorial which appeared in the Monthly Bulletin of the California Department of Agriculture and in an accompanying article published in the same issue, that of February, 1927. We quote the editorial, as well as the basis for it, in the hope that our readers will find food for thought. If our Florida readers will substitute for the word "California" the word "Florida" and for "Mediterranean fruit fly" the term "West Indian fruit fly", they can well realize what has happened here at our Florida ports on several occasions and can better appreciate the protective work which is being done on both sides of the continent. The interests of California and of Florida along the lines of production, as well as of protection, are so similar that a close relationship exists between the organizations of the two states and the dangers to which both states are exposed are of such a similar nature that the activities of the organizations are conducted in close cooperation. We recommend to our readers a careful perusal of the editorial here quoted and of the quotation from the article referred to.

"Routine inspection of vessels with their passengers, baggage and cargoes at maritime ports and of vehicles at border quarantine stations reveals ordinary interceptions of important pests day after day. This keeping out of dangerous insect and disease pests is justified without question. Yet, occasionally, startling interceptions awaken the realization of California orchardists that even one finding of consequence in a decade more than compensates for the insurance premiums paid in the form of detailed quarantine inspection.

"Such an instance occurred in January. The proof of a constantly mentioned probability was forthcoming. Live Mediterranean fruit fly larvae and pupae had, since their stowage together with their hosts in a trunk in Hawaii, followed Nature's dictates and merged to adult form enroute. Numbers of them had found comfortable harborage in the pulp surrounding the seed of the Kamani nut or tropical almond.

"Picture the situation of opening a container holding these fruit devas-

tators in or near a fruit growing community! If these flies were capable of emerging in transit, surely they could continue to emerge after arrival. The results, should they find congenial hosts in California, are self-evident.

"They shall not pass! Thus sounds the order. Yet there are those who would believe that the inspector should be able to tell what is inside the host fruit, but who can judge what is inside of an apple by its skin? Therefore, every host fruit of Mediterranean fruit fly must be taken at inspection and, furthermore, destroyed, for who may know of its most dangerous contents. Even those who do not understand the problems of quarantine would see the menace in a situation such as here mentioned with the facts as they are.

"One of the most far reaching interceptions ever made at a California port of Mediterranean fruit fly or its hosts was at San Pedro during January, in which instance larvae, pupae, and adults of Mediterranean fruit fly were intercepted, as well as certain hosts. The passenger, a resident of Huntington Park, California, made declaration of a box of assorted nuts and seeds. Examination of a package contained in his stateroom disclosed two fresh guavas in which were found several live larvae of the Mediterranean fruit fly. Examination of his trunk disclosed the following material:

11 Kamani nuts
1 Mango seed
3 Kuikui nuts
1 lot of guava seeds
1 lot of Lichee nuts
1 lot of semi-dried persimmons
10 lots miscellaneous seeds
1 boll of raw cotton

"The Kamani nuts were found infested with Mediterranean fruit fly larvae and the boll of raw cotton with live larvae of the pink bollworm of cotton. All of this material was carefully gathered up and burned on board the ship. Underneath a loose piece of paper in the bottom of the box in which the seeds were contained was found a large number of live pupae of the Mediterranean fruit fly, as well as three adults of that insect. This is the first actual interception of adult fruit flies in baggage. Unquestionably, if this passenger had taken this box with these seeds to his home in Huntington Park the fruit fly pupae in the bottom of the box would have emerged and conditions would have been ideal for the establishment of this fly in California. The adults found did actually emerge while in transit; certainly a very critical situation, for had favorable conditions been presented for exit from their container to a host fruit a new infestation would have been occasioned. There has never been any doubt in the minds of quarantine officials that situations such as this could occur, but it is the first time that an actual record has been made of such a happening and it very forcibly emphasizes the fact that rapid transportation in these days makes possible the carrying of living insects of a highly injurious nature between areas where suitable hosts and climatic conditions may be found. Without an ever cautious inspection system, the above box might have been opened in a place where disaster to California fruit crops would have ensued."

BEE DISEASE ERADICATION

REPORT FOR QUARTER ENDING MARCH 31, 1927

Number of apiaries inspected	167
Number of colonies inspected	4,334
Number of apiaries infected with American foul brood	None
Number of colonies infected with American foul brood	None
Number of apiaries infected with European foul brood	None
Number of colonies infected with European foul brood	None

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S QUARTERLY SUMMARY

QUARTER ENDING MARCH 31, 1927

SHIPS AND VESSELS INSPECTED:			
From Foreign Ports—			
Direct	731		
Via U. S. Ports	149		
Total		880	
From U. S. Ports other than Florida		628	
From Florida Ports		192	
Total			1,700
NUMBER OF PARCELS INSPECTED:			
Arriving by water—			
Passed		114,110	
Treated and passed		258,741	
Returned to shipper		1,290	
Contraband destroyed		1,832	
Total			375,973
Arriving by land—Express, Freight, Wagon, etc.:			
Passed		2,621	
Treated and passed		67	
Returned to shipper		31	
Contraband destroyed		11	
Total			2,730
Arriving by mail:			
Passed		1,021½	
Treated and passed		11	
Returned to shipper		2	
Contraband destroyed		11½	
Total			1,046
GRAND TOTAL OF PARCELS INSPECTED			379,749
Number of parcels on hand pending determination as to final disposition		2	

DEPARTMENT OF CITRUS CANKER ERADICATION

REPORT ON ERADICATION WORK IN COOPERATION WITH THE BUREAU OF PLANT INDUSTRY, UNITED STATES DEPARTMENT OF AGRICULTURE, FOR QUARTER ENDING MARCH 31, 1927

Citrus grove trees inspected	2,737,265
Citrus nursery trees inspected	28,736,844
Inspectors employed on citrus canker eradication	39
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

GENERAL SUMMARY

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15,158
Nursery trees found infected since May, 1914	342,260
Number properties found infected to March 31, 1927	513
Properties declared no longer "danger centers"	512*
Properties still classed as actively infected March 31, 1927	1

*Two of the formerly actively infected properties are still resting under certain restrictions, which apply directly to these properties, but do not affect adjoining or contiguous properties. These restrictions refer to methods of cultivation, etc.

Department of Citrus Canker Eradication (Report Continued)

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to March 31, 1927.

1914		1915		1916		1917		1918		1919		1920	
Jan.		Jan.	306	Jan.	86	Jan.	14	Jan.	0	Jan.	0	Jan.	0
Feb.		Feb.	165	Feb.	21	Feb.	4	Feb.	1	Feb.	0	Feb.	0
Mar.		Mar.	444	Mar.	49	Mar.	9	Mar	1	Mar.	1	Mar.	0
Apr.		Apr.	408	Apr.	49	Apr.	169	Apr.	2	Apr.	1	Apr.	0
May	108	May	1042	May	338	May	52	May	1	May	1	May	0
Jun.	160	Jun.	772	Jun.	450	Jun.	45	Jun.	10	Jun.	0	Jun.	0
Jul.	275	Jul.	651	Jul.	349	Jul.	39	Jul.	0	Jul.	0	Jul.	539
Aug.	1313	Aug.	1845	Aug.	219	Aug.	30	Aug.	0	Aug.	1	Aug.	1
Sep.	767	Sep.	618	Sep.	124	Sep.	6	Sep.	0	Sep.	0	Sep.	0
Oct.	565	Oct.	214	Oct.	451	Oct.	2	Oct.	0	Oct.	0	Oct.	0
Nov.	773	Nov.	494	Nov.	131	Nov.	1	Nov.	0	Nov.	0	Nov.	0
Dec.	866	Dec.	256	Dec.	27	Dec.	1	Dec	0	Dec.	0	Dec.	0
Total	4827	Total	6715	Total	2294	Total	372	Total	15	Total	4	Total	540

1921		1922		1923		1924		1925		1926		1927	
Jan.	0	Jan.	0	Jan.	1	Jan.	0	Jan.	0	Jan.	0	Jan	0
Feb.	0	Feb.	0	Feb.	1	Feb.	0	Feb.	0	Feb	0	Feb	0
Mar.	0	Mar.	0	Mar.	2	Mar.	0	Mar.	5	Mar.	0	Mar	0
Apr.	0	Apr.	0	Apr.	3	Apr.	0	Apr.	0	Apr.	0		
May	0	May	585	May	2	May	0	May	0	May	0		
Jun.	0	Jun.	168	Jun.	1	Jun.	0	Jun.	0	June	0		
July	0	Jul.	28	Jul.	0	Jul.	0	Jul.	0	July	0		
Aug.	0	Aug.	34	Aug.	0	Aug.	0	Aug.	0	Aug	0		
Sep.	0	Sep.	23	Sep.	0	Sept.	0	Sep.	0	Sept.	0		
Oct.	0	Oct.	19	Oct.	1	Oct.	0	Oct.	0	Oct	0		
Nov.	0	Nov.	12	Nov.	0	Nov.	0	Nov.	0	Nov.	0		
Dec.	0	Dec.	4	Dec.	0	Dec.	0	Dec.	0	Dec.	2		
Total	0	Total	873	Total	11	Total	0	Total	5	Total	2		

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THE MONTHLY BULLETIN

(Formerly the Quarterly Bulletin)

OF THE

STATE PLANT BOARD

OF FLORIDA

Contents and Index

Volume XII

1927-1928

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THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII July, 1927 No. 1

THE FLORIDA PLANT ACT OF 1927

AN ACT to Prevent the Introduction into and Dissemination Within This State of Insect Pests and Diseases Injurious to Plants and Plant Products of this State, to Provide for the Inspection and Control of Nurseries and the Regulation of the Sale and Distribution of Plants and Plant Products, to Create a State Plant Board and to Prescribe its Powers and Duties, and Making an Appropriation for the Purpose of Carrying out the Provisions of Said Act.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF FLORIDA:

Section 1. This Act shall be known by the short title of "The Florida Plant Act of 1927."

Section 2. For the purpose of this Act, the following terms, when used in this Act or the rules, regulations and orders made pursuant thereto, shall be construed, respectively, to mean:

Insect Pests and Diseases.—Diseases and insect pests, injurious to plants and plant products of this state, including any of the stages of development of such diseases and insect pests.

Plants and Plant Products.—Trees, shrubs, vines, forage and cereal plants, and all other plants, cuttings, grafts, scions, buds and all other parts of plants; and fruit, vegetables, roots, bulbs, seeds, wood, lumber, and all other plant products.

Nursery Stock.—All plants, trees, shrubs, vines, bulbs, cuttings, grafts, scions and buds grown or kept for or capable of propagation, distribution or sale.

Nursery.—Any grounds or premises on or in which nursery stock is grown or propagated for sale or distribution.

Nurseryman.—Any person engaged in the production of nursery stock for sale or distribution.

Dealer.—Any person not a grower of nursery stock in this state who buys or otherwise acquires nursery stock for the purpose of reselling or reshipping independently of any control of the nurseryman.

Agent.—Any person selling or distributing nursery stock under the partial or full control of a nurseryman.

Places.—Vessels, railroad cars, automobiles, and other vehicles, buildings, docks, nurseries, orchards and other premises where plants and plant products are grown, kept or handled.

Persons.—Individuals, associations, partnerships and corporations, whether private, public or municipal.

All words shall be construed to import either the plural or the singular, masculine or feminine, as the case demands.

Section 3. There is hereby created and established a State Plant Board, hereinafter called the Board. The said Board shall be composed of five members who shall be the same persons who constitute the Board of Control created and authorized by the provisions of Chapter 5384, Laws of Florida 1905, and all of the authority by this Act granted to the Board herein created and all the duties required of said Board shall be exercised and performed by the members of the Board of Control, acting as the State Plant Board. A majority of the members of the Board shall constitute a quorum for all purposes. The Chairman of the Board shall be selected annually by the members thereof. They shall be provided with a suitable office or offices at the University of Florida where the meetings of the Board may be held and its records shall be kept.

Section 4. It shall be the duty of the Board to protect the agricultural and horticultural interests of the State from insect pests and diseases, and to that end it is vested with power and authority to:

(1) Inspect, or cause to be inspected by duly authorized employees, plants, plant products or other things and substances that may, in their opinion, be capable of disseminating or carrying insect pests and diseases, and for this purpose shall have power to enter into or upon any place and to open any bundle, package or other container containing, or thought to contain, plants or plant products or other things capable of disseminating or carrying insect pests or diseases;

(2) Carry on investigations of methods of control, eradication and prevention of dissemination of insect pests and diseases, and for that purpose may employ the necessary experts and may rent, lease or purchase the necessary land when required for this purpose;

(3) Supervise or cause the treatment, cutting and destruction of plants when necessary to prevent or control the dis-

semination of insect pests and diseases or to eradicate same and to prescribe rules and regulations therefor;

(4) Inspect, or cause to be inspected, all nurseries in the state at such intervals as they may deem best, and they shall have plenary power to make all such rules and regulations governing nurseries and the movement of nursery stock therefrom or the introduction of nursery stock therein as they may deem necessary in the eradication, control or prevention of the dissemination of insect pests and diseases;

(5) Make rules and regulations to govern the sale and distribution of nursery stock by dealers and agents;

(6) Provide rules and regulations under which nursery stock may be brought into this state from other states, territories and foreign countries;

(7) Make such rules and regulations with reference to plants and plant products while in transit through this state as may be deemed necessary to prevent the introduction into and dissemination within this state of injurious plant pests and diseases;

(8) Demand of any person who has plants or plant products or other things likely to carry insect pests and diseases in his possession to give full information as to the origin and source of same, and it shall be a misdemeanor for such person to refuse to give the information demanded, if able to do so;

(9) Declare a dangerous insect pest or disease to be a public nuisance as well as any plant or other thing infested or infected therewith or that has been exposed to infestation or infection and therefore likely to communicate same;

(10) Declare a quarantine against any area, place, nursery, grove, orchard, county or counties within this state, other states, territories, foreign countries or portion thereof in reference to dangerous insect pests or diseases and prohibit the movement within this state or any part thereof or the introduction into this state from other states, territories or foreign countries of all plants, plant products or other things from such quarantined places or areas which are likely to carry such dangerous insect pests and diseases if such quarantine be determined, after due investigation, to be necessary in order to protect the agricultural and horticultural interests of this state. In such cases the quarantine may be made absolute, or rules and regulations may be adopted prescribing the method and manner

under which the prohibited articles may be moved into or within, sold or otherwise disposed of in this state;

(11) Intercept and inspect while in transit, or after arrival at destination, all plants, plant products or other things likely to carry insect pests and diseases being moved in this state or brought into this state from another state, territory or foreign country, and if upon inspection the same be found to be infested or infected with an injurious insect pest or disease or if such material is believed to be likely to communicate or transmit same or is being transported in violation of any of the rules and regulations of the Board, then said plants, plant products or other things may be treated when necessary and released, returned to the sender or destroyed, such disposition to be determined under rules and regulations to be prescribed by the Board;

(12) Purchase all necessary materials, supplies, office and field equipment and other things and to make such other expenditures as may be essential and necessary in carrying out the provisions of this Act within the limits of the amount appropriated by law;

(13) Appoint such assistants, inspectors and other employees as may be required, and to prescribe their duties and fix their compensation, to delegate to such assistants, inspectors and other employees such powers and authority as may be deemed proper within the limits of the powers and authority conferred upon the Board by this Act;

(14) Enter into cooperative arrangements with any person, municipality, county and other departments of this state, and Boards, officers and authorities of other states and the United States for inspection with reference to insect pests and plant diseases and for the control and eradication thereof and to contribute a just proportionate share of the expenses incurred under such arrangements;

(15) Publish at regular intervals, to be determined by them, an official organ of the Board for public distribution and may from time to time publish and distribute to the public such further information as may be deemed necessary;

(16) Enforce the provisions of this Act and the rules and regulations made pursuant thereto by writ of injunction in the proper court as well as by criminal proceedings. It shall be the duty of the Attorney General, the State Attorneys, Prosecuting

Attorneys, County Solicitors, and all public prosecutors in each county to represent the Board when called upon to do so. The Board in the discharge of its duties and in the enforcement of the powers herein delegated may employ counsel, send for books and papers, administer oaths and hear witnesses, and to that end it is made the duty of the various sheriffs throughout the state to serve all summonses and other papers upon request of said Plant Board.

Section 5. All rules and regulations made by the Board shall be promulgated by publishing same in the official organ of the Board, or by giving such other reasonable public notice as may be prescribed by the Board, provided that in case of emergency where it is necessary to place a quarantine to take effect immediately, promulgation may be made by proclamation of the Governor on the request of the Board. Printed copies of all acts, rules, regulations, quarantines or notices of the Board which shall be published under the authority of the Board shall be admitted as sufficient evidence of such acts, rules, regulations, quarantines or notices in all courts and on all occasions whatsoever provided the correctness of such copies be certified to by the Chairman of the Board.

Section 6. Any person affected by any rule or regulation made or notice given pursuant to this Act may have a review thereof by the Board for the purpose of having such rule, regulation or notice modified, suspended or withdrawn. Such review shall be allowed and considered and the cost thereof fixed, assessed, collected and paid in such manner and in accordance with such rules and regulations as may be prescribed by the Board.

Section 7. The introduction into this state of any live insect or specimen of any disease injurious to plants, except under a special permit issued by the Board is hereby prohibited.

Section 8. Any person, including common carriers, who receives plants, plant products or other things sold, given away, carried, shipped or delivered for carriage or shipment within this state, as to which provisions of this Act and the rules and regulations made pursuant thereto have not been complied with, shall immediately inform the Board or an inspector thereof and isolate and hold the said plant, plant product or other thing unopened or unused subject to such inspection or other disposition as may be provided by the Board.

Section 9. Whenever the Board under the provisions of this Act shall declare a quarantine against any place, nursery, grove, orchard, county or counties of this state, other states, territories or foreign countries as to a dangerous insect pest or disease, it shall be unlawful thereafter until such quarantine is removed for any person to introduce into this state, or to move, sell or otherwise dispose of within this state any plant, plant product or other thing included in such quarantine, except under such rules and regulations as may be prescribed by the Board.

Section 10. It shall be unlawful for any nurseryman, dealer, or agent to sell, give away, carry, ship or deliver for carriage or shipment any nursery stock except in compliance with the provisions of this Act and the rules and regulations made pursuant thereto.

Section 11. Any person who shall violate any provision or requirement of this Act or of the rules and regulations made thereunder or of any notice given pursuant thereto, or who shall forge, counterfeit, destroy or wrongfully or improperly use any certificate provided for in this Act or in the rules and regulations made pursuant thereto, or who shall interfere with or obstruct any inspector or other employee of the Board in the performance of his duties, shall be deemed guilty of a misdemeanor and upon conviction thereof shall be punished by a fine of not less than twenty-five dollars or more than five hundred dollars, or by imprisonment for not more than six months, or by both such fine and imprisonment at the discretion of the court.

Section 12. In construing and enforcing the provisions of this Act, the act, omission or failure of any official, agent or other person acting for or employed by any association, partnership, corporation or other principal within the scope of his employment or office shall in every case be deemed the act, omission or failure of such association, partnership, corporation or other principal as well as that of the individual.

Section 13. If any section or part of a section of this Act shall for any cause be held unconstitutional, such fact shall not affect the remainder of the Act.

Section 14. For the purpose of carrying out the provisions of this Act, the sum of thirty-five thousand dollars per annum or as much thereof as may be necessary is hereby appropriated out of any funds in the treasury not otherwise appropriated,

which said sum, together with all other sums appropriated under this Act shall be placed to the credit of the Board in the hands of the State Treasurer to be expended by the Board upon a written voucher drawn by the Board in duplicate stating the nature of such expenditure and the person to whom same shall be made payable, which voucher shall be submitted to the Comptroller of the State of Florida and audited and approved by him. Upon such approval the Comptroller shall draw his warrant upon the State Treasurer for the payment thereof. No voucher shall be issued or drawn by the Board for the payment of any moneys except the same be approved by said Board and countersigned by the Chairman or by such member of the Board as may be acting as Chairman in the absence or disability of the Chairman, and the Secretary thereof.

Section 15. The State Plant Board created by this Act is hereby declared and created a corporate body. The said corporation shall have power to contract and be contracted with and to have and possess all the powers of a body corporate for all purposes necessary for fully carrying out the provisions and requirements of this Act. The Board shall have a corporate seal to be selected by it.

Section 16. All Acts and parts of Acts inconsistent with the provisions of this Act are hereby repealed, provided that the Plant Board as now existing under the Plant Act of 1915 shall continue to exist and function until the Plant Board provided for in this Act shall have been appointed and organized. The Board provided for in this Act shall succeed to and take over all the records, books, office equipment and all other property and things now held, owned or possessed by the Plant Board now existing under the Plant Act of 1915, and all the lawful rules, regulations, orders or other Acts of the Plant Board created under the Plant Act of 1915 shall remain in full force and effect until repealed by the Board provided for in this Act. It is further provided that all employees now in the service of the Board shall retain their positions and receive the salaries now provided for them until removed or replaced by the appointments made under the provisions of this Act.

Section 17. This Act shall take effect upon its passage and approval by the Governor or upon its becoming a law without his approval.

Approved May 19, 1927.

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State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

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SALUTATORY

With this issue of our little publication we enter the field of monthly publications. Heretofore our numbers have appeared quarterly. The Quarterly Bulletin of the State Plant Board of Florida is discontinued and now we make our initial bow as The Monthly Bulletin of the State Plant Board of Florida. We have flattered ourselves that in the past our publication has served some useful purpose. It will be our object to make The Monthly Bulletin even more so.

It is our purpose to continue the policy of publishing articles of interest to both scientist and layman pertaining to plant pest control. The Monthly Bulletin will also serve as the official organ of the State Plant Board for disseminating information regarding official acts of the Board, such as passage of rules and regulations, issuance of public notices, etc. In this latter respect it is expected that the public will be kept better informed than in the past as to the activities of the Board. The utilization of The Monthly Bulletin for this purpose is in accordance with a provision of the Plant Act of 1927 enacted by the last State Legislature which authorizes the Board to publish an official organ

and give publicity to its actions through this medium. The practice heretofore followed of publishing the rules and regulations of the Board in circulars consecutively numbered will be discontinued.

THE PLANT ACT OF 1927

A new Plant Act has been passed and is now law. This Act is known by the short title of The Plant Act of 1927. It was passed by the State Legislature at its 1927 session and was approved by the Governor May 19, 1927. The Plant Act of 1915, under which the State Plant Board has been operating for twelve years, was repealed with the passage of the Act of 1927. No startling or revolutionary change has been made in the law applying to plant movement into and within the state and the control of plant pests. The old law was a good law and served its purpose well. The Plant Board functioned efficiently under it. In practice it was found to be somewhat involved and cumbersome. With time and use, a number of weaknesses were discovered.

A decision of the United States Supreme Court in March of 1926, in a case appealed from the State of Washington, invalidated certain features of the Florida Plant Act of 1915, as well as similar laws of a number of other states, on account of a certain conflict between the state laws and the Federal Plant Quarantine Act of 1912. The state laws undertook to exercise jurisdiction over interstate shipments of plants and plant products. The Supreme Court decision determined that the states did not have this right, inasmuch as the Congress, through the Act of 1912, vested this duty and right in the United States Department of Agriculture. By reason of the decision, the states were deprived of a right which not only they but also the federal authorities had always thought the states possessed. The whole plan of affording protection against distribution of plant pests was threatened, for a close cooperative relationship was required as between the Federal Government and the states and as between the different states if full protection was to be afforded. This situation was brought to the attention of Congress, with the result that the Federal Plant Quarantine Act of 1912 was amended in such manner as to give the states the rights of which they had been deprived through the Supreme Court decision and also providing for cooperative relations between Federal and State Governments.

The decision of the Supreme Court did not affect state horticultural inspection laws enacted prior to the passage of the Act of 1912. Laws passed subsequently, however, were affected. In this latter class was our own Florida Plant Act of 1915. It was therefore necessary for Florida and such other states as were affected to either reenact their old laws or pass entirely new laws if full benefit of the amended Federal Act was to be secured.

The State Plant Board caused to be prepared and studied the draft of a new law to be presented to the legislature for consideration. This draft in its essentials was similar to the Act of 1915 but was greatly simplified and shortened and numerous weaknesses and defects in the 1915 law were corrected. The draft was submitted for critical study to a number of interested Floridians, to experienced plant quarantine officers of the Federal Government, and to officials of other states. Numerous suggestions were received and considered. The draft in its final form was presented to the State Legislature and was passed with few changes. The Act was approved by the Governor on May 19, 1927. In this issue of The Monthly Bulletin the Florida Plant Act of 1927 is published. Nurserymen, fruit growers and citizens generally should read this law.

The rules and regulations passed under the Act of 1915 are still in effect under the provisions of the Act of 1927.

THE MONTHLY BULLETIN

State Plant Board of Florida

RULES AND REGULATIONS MADE BY THE STATE PLANT BOARD PURSUANT TO THE FLORIDA PLANT ACT OF 1927

In accordance with subsection 15 of Section 5 of the Plant Act of 1927 all regulations, rules, public notices and other official acts of the State Plant Board which should be given publicity may be published in an official organ of the Board which the Board is authorized to issue at regular intervals to be determined by the Board. The Board has authorized the publication of a Monthly Bulletin in which hereafter all rules, regulations, etc., will appear. All rules and regulations passed by the Board have the full force and effect of law.

RULES AND REGULATIONS ADOPTED JUNE 23, 1927

Rule 51. By reason of the serious situation created through the recent discovery of the presence in certains areas in the State of Texas of the Mexican Fruit Fly or Morelos Orange Maggot *(Anastrepha ludens* Loew.) and in order to prevent the introduction of this pest into the State of Florida the shipment into or delivery within the State of Florida of all host fruits of the Mexican Fruit Fly *(Anastrepha ludens* Loew.) including citrus, apple, plum, quince, peach, pear, mango, *Achras sapote,* mamey, Annona and guava originating in or shipped from the Counties of Cameron, Hidalgo and Willacy, or from such other and additional areas in the State of Texas as may hereafter be found to be infested by the Mexican Fruit Fly *(Anastrepha ludens* Loew.) is hereby prohibited. All such fruits arriving in the State of Florida in violation of this rule shall be subject to immediate confiscation and destruction.

RULES AND REGULATIONS ADOPTED JULY 11, 1927

MEXICAN BEAN BEETLE RULE REPEALED—SHIPMENTS OF GREEN BEANS, ETC., MAY NOW BE MADE INTO FLORIDA WITHOUT PERMIT

The State Plant Board at its regular monthly meeting held at Jacksonville, Florida, July 11, 1927, repealed its Rule No. 48, prohibiting the shipment into Florida of green beans, green peas, etc., from certain states known to be infested by the Mexican bean beetle, unless accompanied by special permit. By reason of this action, green beans and green peas may now be accepted for transportation into Florida without permit.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEPARTMENT REPORTS

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S QUARTERLY SUMMARY

QUARTER ENDING JUNE 30, 1927

SHIPS AND VESSELS INSPECTED:			
From Foreign Ports:			
Direct	631		
Via U. S. Ports	138		
Total		769	
From U. S. Ports other than Florida		543	
From Florida Ports		165	
Total			1,477
NUMBER OF PARCELS INSPECTED:			
Arriving by water—			
Passed		957,511	
Treated and passed		139,927	
Returned to shipper		1,083	
Contraband destroyed		495	
Total			1,099,016
Arriving by land—express, freight, wagon, etc.—			
Passed		5,847	
Treated and passed		3,251	
Returned to shipper		73	
Contraband destroyed		19	
Total			9,190
Arriving by mail—			
Passed		$697\frac{1}{2}$	
Treated and passed		4	
Returned to shipper		$8\frac{1}{2}$	
Contraband destroyed		10	
Total			720
GRAND TOTAL OF PARCELS INSPECTED			1,108,926
Number of parcels on hand pending determination as to final disposition			24

BEE DISEASE ERADICATION

REPORT FOR QUARTER ENDING JUNE 30, 1927

Number of apiaries inspected	367
Number of colonies inspected	11,188
Number of apiaries infected American foul brood	5
Number of colonies infected American foul brood	13
Number of apiaries infected European foul brood	None
Number of colonies infected European foul brood	None

DEPARTMENT OF CITRUS CANKER ERADICATION

Report on Eradication Work in Cooperation with the Bureau of Plant Industry, United States Department of Agriculture, for Quarter Ending June 30, 1927

Citrus grove trees inspected	4,384,417
Citrus nursery trees inspected	30,831,103
Inspectors employed on citrus canker eradication.	39
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

General Summary

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15,158
Nursery trees found infected since May, 1914	342,260
Number properties found infected to June 30, 1927	513
Properties declared no longer "danger centers"	512
Properties still classed as actively infected June 30, 1927	1

Department of Citrus Canker Eradication (Report Continued)

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to June 30, 1927:

1914		1915		1916		1917		1918		1919		1920		1921		1922		1923		1924		1925		1926		1927	
Jan.		Jan.	806	Jan.	86	Jan.	14	Jan.	0	Jan.	0	Jan.	0	Jan.	0	Jan.	0	Jan.	1	Jan.	0	Jan.	0	Jan.	0	Jan	0
Feb.		Feb.	165	Feb.	21	Feb.	4	Feb.	1	Feb.	0	Feb.	0	Feb.	0	Feb.	0	Feb.	1	Feb.	0	Feb.	0	Feb.	0	Feb.	0
Mar.		Mar.	444	Mar.	49	Mar.	9	Mar.	1	Mar.	1	Mar.	0	Mar.	0	Mar.	0	Mar.	2	Mar.	0	Mar.	5	Mar.	0	Mar	0
Apr.		Apr.	408	Apr.	49	Apr.	169	Apr.	2	Apr.	1	Apr.	0	Apr.	0	Apr.	0	Apr.	3	Apr.	0	Apr.	0	Apr.	0	Apr.	0
May	108	May	1042	May	338	May	52	May	1	May	1	May	0	May	0	May	585	May	2	May	0	May	0	May	0	May	0
Jun.	160	Jun.	772	Jun.	450	Jun.	45	Jun.	10	Jun.	0	Jun.	0	Jun.	0	Jun.	168	Jun.	1	Jun.	0	Jun.	0	June	0	June	0
Jul.	275	Jul.	651	Jul.	349	Jul.	89	Jul.	0	Jul.	0	Jul.	589	July	0	Jul.	28	Jul.	0	Jul.	0	Jul.	0	July	0		
Aug.	1313	Aug.	1845	Aug.	219	Aug.	80	Aug.	0	Aug.	1	Aug.	1	Aug.	0	Aug.	34	Aug.	0	Aug.	0	Aug.	0	Aug.	0		
Sep.	767	Sep.	618	Sep.	124	Sep.	6	Sep.	0	Sep.	0	Sep.	0	Sep.	0	Sep.	23	Sep.	0	Sept.	0	Sep.	0	Sept.	0		
Oct.	565	Oct.	214	Oct.	451	Oct.	2	Oct.	0	Oct.	0	Oct.	0	Oct.	0	Oct.	19	Oct.	1	Oct.	0	Oct.	0	Oct.	0		
Nov.	778	Nov.	494	Nov.	181	Nov.	1	Nov.	0	Nov.	0	Nov.	0	Nov.	0	Nov.	12	Nov.	0	Nov.	0	Nov.	0	Nov.	0		
Dec.	366	Dec.	256	Dec.	27	Dec.	1	Dec.	0	Dec.	0	Dec.	0	Dec.	0	Dec.	4	Dec.	0	Dec.	0	Dec.	0	Dec.	2		
Total	4327	Total	6715	Total	2294	Total	372	Total	15	Total	4	Total	540	Total	0	Total	873	Total	11	Total	0	Total	5	Total	2		

THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII August, 1927 No. 2

SWEET POTATO WEEVIL ERADICATION IN FLORIDA AND GEORGIA*

By B. L. BOYDEN
Associate Entomologist, U. S. Department of Agriculture

INTRODUCTION

The sweet potato weevil *(Cylas formicarius* (Fabr.)) wherever it occurs in Florida, is without doubt the most important insect enemy of the sweet potato crop and constitutes a constant menace to that portion of the State yet uninfested. It is not a native of the United States, probably having been introduced at one of the Gulf ports some years prior to 1875. It was reported in New Orleans in 1875 and in 1878 was reported as doing considerable damage to sweet potatoes in Manatee County, Florida. Since its introduction into the United States, its range has extended until at the present time it is known to occur along most of the Gulf Coast from Brownsville, Texas, to Key West, Florida, and along the Atlantic coast of Florida north to Jacksonville. In Texas and Louisiana it has become firmly established at a considerable distance inland.

From 1878 until 1916 numerous reports were made of its occurrence in southern Florida along the lower East Coast from Miami to Daytona. It was not until December, 1916, when specimens were received from Sanderson, Baker County, that the weevil was known to occur in northern Florida, the main sweet potato producing area of the State.

An investigation of the outbreak in the northern part of the State was made in 1917 by an inspector of the State Plant Board of Florida. Several farms at Sanderson, Glen Saint Mary and Macclenny, Baker County, and also in Charlton County, Georgia, were found to be infested. The following statement is taken from a report[1] on this infestation by Doctor Wilmon Newell, of the Florida State Plant Board: "On the farms where the in-

*Published under authorization from the Chief of the Bureau.
[1]Quarterly Bul. of the State Plant Board of Florida, Vol. II, No. 1.

sects had been noticed for three seasons, Mr. Bragdon found that the crop of 1916 was so badly damaged as to cause the farmers to discard from thirty to fifty percent of the crop at the time of digging, and potatoes from the 1916 crop which were placed in storage were entirely ruined by the weevil before the spring of 1917."

This outbreak of the weevil in the northern part of Florida was viewed with considerable alarm, as it was believed that in the course of a few years the insect would spread over the main sweet potato growing area of the State. Although the initial outbreak was serious, it was believed that the infestation was of comparatively recent origin and that prompt measures of control would prevent the spread of the weevil or even eradicate it, thus removing, for some time at least, this menace to the sweet potato growing industry of Florida.

Fig. 1.—Feeding marks and egg punctures of adult sweet potato weevil.

Nature of Injury

The sweet potato weevil injures the sweet potato by feeding on the leaves, vines, stalks and roots or "tubers" in the field and on potatoes in storage. The adult weevil attacks all parts of the plant and the young, or worms, tunnel through the vines, stalks and roots. The attack on the vines by the worms causes them to die and the roots become riddled and filled with excreta, rendering them entirely unfit as food. (See Figs. 1 and 2.)

During the process of egg laying the adult weevils often girdle the base of the stalks with egg punctures, thus checking the plant growth before the roots are formed.

Fig 2.—Cross section of sweet potato showing weevil injury

Description, Life History and Habits of the Weevil

An account of the life history and habits of the weevil is important, as the plans of eradication were based upon these.

Description

The adult weevil (Fig. 3, *a)* is a strikingly colored snout beetle about one-fourth of an inch long. The body and snout of the beetle are dark metallic blue, while the legs and the thorax or waist are reddish brown. One not familiar with the weevil might readily mistake it for a large red ant.

The Egg and Egg Deposition

The egg is dull white in color, oval in shape, and about one-fortieth of an inch in length. The weevil lays its eggs singly in the vines or exposed roots. The female eats out a pit just about large enough to receive an egg and after laying carefully plugs the pit with excrement. The weevil seems to prefer to feed and lay its eggs in exposed roots rather than in the vines.

However, many observations and laboratory experiments indicate that it will not dig into the ground to attack the roots. Where the roots are infested the weevils have probably entered through cracks in the soil and laid their eggs or else the larvae or worms have tunneled down into the roots from the vine. In the vines the thick base seems to be the preferred spot for egg laying, probably because of the weevil's habit of seeking the most sheltered places and because of the large size of the vine at the base. Next in order of preference are the nodules or

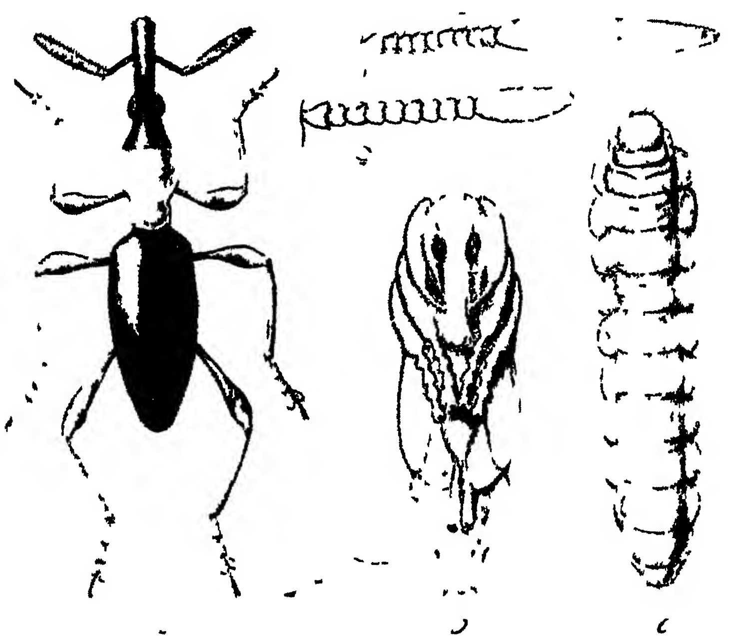

Fig. 3.—*a*, adult weevil, *b*, pupa; *c*, larva or worm

points from which the leaves and branches start. Egg laying begins shortly after the weevil emerges and continues at the rate of 1 to 8 eggs a day throughout most of its life.

The Larva or Worm

The egg hatches in a few days and the white, brown-headed worm or larva, (Fig. 3, *c*) feeds within the potato or stalk until

it is full-grown. The full-grown larva is about three-eighths of an inch in length. The worm in feeding in the vine or root leaves a tunnel filled with excrement. This tunnel starts with the egg pit and ends with a larger cavity in which the worm changes to the pupa or inactive stage before emerging as an adult weevil.

The Pupa and Newly Emerged Adult

The pupa (Fig. 3, *b*) is yellowish white in color and about one-sixth of an inch long. The adult weevil when it first changes from the pupa is also yellowish white in color and soft. It gradually hardens and its color darkens and changes until within two or three days it is a fully matured beetle. It then starts feeding and eats its way to the surface of the vine or root. The time taken for the adult to emerge from the root depends in a large measure upon the distance between the pupal cavity and surface of the potato.

Life History

The time required for the weevil's development from the laying of the egg to the emergence of the adult varies with the temperature. During the warmest period of the summer it requires about thirty days for the insect to develop, while in the winter the period of growth is greatly extended. During the very cold periods development is probably temporarily checked altogether, though such periods are too short to be termed hibernations.

In one instance, when eggs were laid in sweet potatoes August 1, 1925, the first adult came out 28 days later. The temperature during the period was as follows:

	° F.
Average daily minimum	79.3
Average daily maximum	88.9
Average daily mean	84.1
Minimum for period	74.0
Maximum for period	93.0

Eggs laid January 1, 1925, produced the first adult 97 days later. The temperature during the period was as follows:

	° F.
Average daily minimum	60.6
Average daily maximum	72.3
Average daily mean	66.5
Minimum for period	42.0
Maximum for period	82.0

The record given below of the development of an individual weevil shows the relative length of the different stages.

August 8, 1925. Egg laid.
August 14, 1925. Egg hatched. Egg stage, 6 days.
August 26, 1925. Larva changed to pupa. Larval stage, 12 days.
September 1, 1925. Pupa changed to adult. Pupal stage, 6 days.
September 4, 1925. Adult fully colored, mature.
September 7, 1925. Adult laid first egg, pre-egg-laying stage 6 days.
Total length of time from egg to egg, 30 days.

All the above records were obtained in an unheated room in the laboratory at Tampa, where the temperatures were comparable with those in an ordinary sweet potato bank at the same time of the year.

Hibernation

No indication of hibernation of the sweet potato weevil has been noted in Florida either in the field or in the laboratory. In fact, all evidence is to the contrary. During fall inspection in Baker County active adult weevils were noticed in the field as late as December 15 and were collected as early as January 14 under potatoes placed in cleaned fields as traps.

On January 13, 1927, at Tampa, after several days of cool weather when the thermometer in a screened insectary registered minimum temperatures of 32,° 29° and 23° F., on January 10, 11 and 12, respectively, three sweet potatoes were placed in the laboratory yard. On the 14th the potatoes were examined and no weevils found. No examination was made on the 15th and 16th. On the 17th one male weevil was found. On the 18th two females, one male and one egg were observed and several feeding marks showed on the potatoes. On the 20th three females, three eggs and numerous feeding marks were found. On the 21st three females, several feeding marks and six eggs were found. In an unheated laboratory, egg laying was continuous throughout the winter except on unusually cool days.

Manner of Weevil Spread

While the adult sweet potato weevil has well developed wings and is capable of making at least short flights, this method of movement seems to be of little importance in the distribution of the pest under conditions existing in central and northern

Florida. The spread of the weevil along the coast in the seaside morning-glory, which is now generally infested, is easily accounted for by the fact that the morning-glory grows in an almost continuous strip. The inland infestations have undoubtedly resulted from the importation of infested sweet potato plants or morning-glory vines, and the farm-to-farm spread can be traced in most instances by the movement of infested planting stock.

The weevil is quite active and no doubt crawls considerable distances, and this is probably an important factor in the spread from farm to farm, especially in thickly settled trucking communities.

Food Plants

The natural food plants of the weevil in Florida, so far as known, are the sweet potato and the closely related morning-glories. The insect feeds readily on a number of species of morning-glory and will breed in all, showing preference for the large-vined, succulent kinds. It has been recorded as feeding on a number of other plants and in laboratory experiments the weevil fed readily on tender plants of the Spanish needle *(Bidens leucantha* (Willd.)) and on roots of cassava. The weevil has never been observed to lay eggs in anything but sweet potato and morning-glories, nor is there any evidence of the weevil feeding on plants of any other type in the open.

The favorite wild host plant of the weevil in Florida is the seaside morning-glory *(Ipomoea Pes-Caprae* (Sweet)) (see Fig. 4), which may be found growing in almost continuous strips on practically every sand beach in Florida. This plant covers the beach just above tide level with a mat of vines. The runners are succulent and shaded by the broad leaves, making an ideal breeding place for the weevil.

In the Baker-Charlton area[*] the only wild morning-glory found was a species locally known as wild sweet potato *(Ipomoea pandurata* L.). This plant, while a host, has never been found infested in this area, although it was present on some of the infested farms. The weevil has been observed feeding on this vine in the laboratory grounds at Tampa, often killing the vines by girdling the runners near the surface of the ground. In the laboratory the weevils showed no perceptible partiality between

[*]Includes the counties of Baker, Fla., and Charlton, Ga.

the roots of this morning-glory and sweet potatoes, either in feeding or breeding. Infested vines and roots have been found near Tampa but the infestation is not general. Since this morning-glory in the Baker-Charlton area was not infested, it was not a factor in the eradication project. The vines of these plants, although attaining considerable length, are small in diameter as compared with the sweet potato and are not nearly so succulent. The roots of this morning-glory are at a considerable depth below the surface and thus are not accessible to the weevil.

Fig 4—Seaside morning-glory.

PRESENT KNOWN DISTRIBUTION OF THE WEEVIL IN FLORIDA

From the beginning of the eradication experiments to the present time considerable inspection for the weevil has been carried on in all parts of the State. In the fall of 1918 the weevil was known to be present along the coast from Tarpon Springs on the West Coast south around the peninsula and north on the East Coast to Ormond Beach. No infestations until this time had been found inland to any distance except the one in Baker County.

Infestations were found at Lily and Seffner in 1920 and 1921. In July, 1923, Mr. J. Harvey Henderson found the weevil in seaside morning-glory at Mount Dora in Lake County. These vines had evidently been brought from the coast for ornamental purposes. Later in the same year Mr. George Tedder found in-

fested seaside morning-glory at Orlando, Orange County, which had probably been introduced in the same way and in a later survey of the area around Mount Dora and Orlando the weevil was found in sweet potatoes on several properties. In 1925 Mr. Henderson found infested seaside morning-glory in Pasco County. In August, 1926, Dr. E. D. Ball reported finding an adult sweet potato weevil near Saint Augustine and in the fall of that year Mr. J. W. McGlamery found the seaside morning-glory generally infested along the East Coast from the north bank of the St. Johns River to a point about ten miles south of St. Augustine. Sweet potatoes on three farms near St. Augustine were also found to be infested. In May, 1927, Mr. McGlamery found the weevil in morning-glory on the beach at Pensacola.

Probable Future Spread

There is not much doubt but that the entire coast of Florida wherever seaside morning-glory occurs will be infested in a few years and that the infestation will increase in intensity. This beach infestation will constitute a continuing menace to the inland potato districts. The beach morning-glory is a very attractive vine and appears to grow well inland. With the growing popularity of the beaches because of their accessibility, due to good roads, inland importations of weevils in these vines will become more frequent. The distribution of the weevil in planting stock will also become more rapid as the infested areas become more numerous. The quarantine laws as enforced by the State Plant Board have been very effective in preventing the spread of the weevil in the past but with good roads and the increasing use of automobiles for transportation a situation is being created which will be difficult to cope with.

Sweet Potato Culture and Weevil Development

Because of the scarcity of wild host plants, the seasonal history of the sweet potato weevil in the Baker-Charlton area is closely related to the growing and storing of sweet potatoes. For this reason the cultural practices followed in growing and storing the crop become of extreme importance in connection with the eradication of the weevil.

How the Crop is Grown

In preparing for a sweet potato crop a piece of new land, when available, alongside the cultivated part of the farm is selected and during the year prior to planting the land to sweet potatoes cattle are penned and fed in the area. Such land is known locally as "cowpenned" land. The cow pens are moved to a new area each year and sugar cane or garden crops are planted in the old sweet potato field. This system is followed year after year, slowly increasing the cleared area on the farm. While this practice is convenient for the farmer, it provides very favorable conditions for the weevil, for the insects remaining in volunteer sweet potatoes or crop remnants in the old field are ready to attack the new crop in the adjoining field.

Sweet Potato Planting Stock

Vine-cuttings or draws used in planting the crop are usually grown locally. The draw-bed is a simple affair, being made by placing a layer of manure on the ground and covering it with an inch or so of soil. The potatoes are laid in the bed close together but not touching and are covered with an inch or more of soil. Plants are pulled from these beds as soon as the season permits and are set in the field. Ordinarily the potatoes are "bedded" in February and the first plants are set in the field in April. As soon as these plants in the field develop runners, vine-cuttings are obtained for planting the later or main crop.

When vine-cuttings are to be used to set the entire crop, a so-called root patch is planted. The seed potatoes are planted usually in February, in ridges in the open field. When the plants have attained sufficient growth, cuttings are made and set out. No potatoes are harvested from the root patch and hogs are allowed to run in it as soon as enough vines have been cut for planting.

Planting stock is sometimes obtained from unharvested portions of the crop which were left in the field over winter. While frost kills the vines during the winter, growth from the old roots begins early in the spring and plants or cuttings are thus obtained. In years of plant shortage. volunteer plants are taken from the old field for part or all of the planting stock.

Sweet Potato Harvest and How It Affects the Weevil

The main sweet potato crop is harvested between the 1st and the 15th of December. At harvest the vines are cut with a sharp hoe at the surface of the ground and rolled into the furrow between the ridged rows. The potatoes are then plowed out, this operation covering the vines in the furrows together with any weevils which may be in the vines. The covered vines are well protected from frost and if excessive moisture does not cause them to rot, the weevils within them will continue their development and issue from the soil. Sweet potatoes left in the field after harvest will also provide food for the weevil. The following will illustrate the importance of the left-over roots as a source of food: a potato after remaining in the soil over winter was removed on the 10th day of April and it was found to contain 65 worms, 18 pupae and 4 adults. Volunteer plants sprouting from the buried vines and roots provide food for the beetles which remain in the field between crops. The uncleaned field thus furnishes an unbroken food supply for the weevils which are not carried into the storage banks.

It is customary to let hogs have the run of the field after digging and they not only eat many of the potatoes but also root up and expose to the weather many of the vines. In some cases, however, sugar cane is planted in the field without "hogging off." This practice results in a heavy growth of volunteer potato plants the following year.

There is an interval of approximately three months between fall harvest and the appearance of plants in the plant beds the following spring. The beds may show infestation due to migration from the old field or the use of infested seed potatoes. Observations have shown that on farms where the weevil is abundant many of the plants become infested before they are in the field.

How the Stored Crop Becomes Infested

Sweet potatoes are dug in the fall and stored in banks or, in some cases, in crude storage houses. The banks (Fig. 5) are usually constructed by placing a bed of pine straw (needles) on the ground. Then potatoes are placed on the pine straw and are protected by a shelter made of short boards and covered with soil. The small banks are conical in shape, while the larger

ones are long, roof-like structures. The storage houses are for the most part floorless log structures, with walls two or three feet high and with shingled roofs. The cracks between the logs are filled with clay or dirt and soil is banked around the house for protection against low temperatures. Pine straw is also used as a bed for the potatoes in the storage house. In addition to the storage banks and houses for potatoes which are to be sold or consumed, there are smaller banks in which seed potatoes are stored. The storage banks naturally vary in size and number according to the preference of the grower and the size

Fig 5—Sweet potato storage banks.

of the crop. They may be either located at the field or near the dwelling and are frequently at both places. Potatoes from the banks are sold and used from time to time and it is customary to keep a supply on hand for home use until new potatoes are available.

Even though the potatoes are carefully sorted at harvest and all those thought to be infested are discarded, it is almost certain that some infested potatoes will be stored. The only outward signs of weevil infestation on newly harvested potatoes are egg punctures and feeding marks of the adults, and these are easily overlooked.

The development and multiplication of the weevil continues in storage, as the temperature within the bank or house is considerably warmer than that on the outside. The infestation

increases until by early summer the bank may be swarming with weevils. Some farmers let the hogs have access to the storage banks after the edible potatoes are used, while others make no effort to dispose of waste potatoes until they are preparing to harvest the next crop. In the first case a few infested potatoes will probably escape the hogs and in the latter case there will be a large number of weevils from the left-over potatoes ready to attack the newly stored crop. Thus it is seen that because of the system of growing and storing sweet potatoes in vogue in the Baker-Charlton area, food is always available for the weevil and the weevil's abundance is determined by the season and the condition of the crop.

The Eradication Campaign

The first step in weevil control was taken by the State Plant Board of Florida and consisted of placing a quarantine on Baker County to stop movement of infested potatoes and thus prevent further spread of the weevil. Officials of the Federal Bureau of Entomology and the State Plant Board then discussed the possibility of eradication and it was determined to undertake a cooperative project on this phase of the problem if a survey indicated that it would be feasible.

A laboratory was established at Macclenny, Florida, in April, 1918. Inspectors were employed and after receiving a short course of instruction were detailed to make a survey of the affected area. During this survey all the farms in Baker and Charlton counties were visited. A special report was prepared on each farm. This included information concerning the growing of sweet potatoes with a history of the infestation and the source of planting stock for the past three years (see report form below).

FIELD AGENT'S REPORT ON GROWER

Sweet Potato Weevil Investigations

Circulars left..............................
Circulars sent..............................

Reported by .... County ....
Name .... Date ....
Address (P.O.) .... Distance .... Direction..... ....
Sweet potatoes (acres grown)..................(bushels stored) ....
Infested—yes; no .... Percent of infestation..........................
Previous infestations ....
Losses (with dates) ....
Have remedies been tried? ....
Results ....

Did you see grower? .... Is he owner or renter? . ...
How did he impress you? (1) enthusiastic; (2) interested; (3) indifferent; (4) opposed; (5) combative ....
Remarks ....
How far to nearest farm?............ .... To nearest sweet potatoes? ....
(Shown on back of form)
Source of seed potatoes or slips (1916) ....
(1917) . ... (1918) ....
material inspected. Potatoes for seed; for food; draw beds; rows; fields grown from slips; from draws; from cuttings.

The inspector, in the course of obtaining these data, advised the farmer as to methods for reducing weevil injury, or, in cases where the property was not infested, cautioned him against obtaining planting stock from other growers.

Upon the completion of this survey, scouting was extended to the adjoining sections of northern Florida and southern Georgia. In 42 counties 5,903 properties were inspected and no weevils found.

The information obtained through this preliminary work indicated that the infestation in Baker and Charlton Counties was localized, more or less isolated, and of comparatively recent origin. Although wild morning-glory *(Ipomoea pandurata* L.) was present in the area, it was found to be weevil-free. Early experiments and observations bore out the published records of the habits of the weevil, especially as to its manner of spread and food plants.

With these facts at hand, it was thought advisable to attempt the eradication of the sweet potato weevil in the Baker-Charlton area. In the fall of 1918 work was started with 196 properties on which the weevil had been found and 68 on which the weevil had not been found but which were probably infested.

It was evident that the success of this eradication experiment depended upon the elimination of or a break in the food supply of the pest. It was not considered feasible at this time to try to persuade the owners of infested farms to discontinue the growing of sweet potatoes.

The cotton boll weevil a few years before had practically destroyed the main money crop of that section, leaving the sweet potato crop as one of their principal sources of income and food for both man and stock. It was not even deemed advisable to try to restrict the acreage, as the country was then at war and production of food was being emphasized. It was decided, therefore, that an educational campaign be carried on with the farmers with the hope that adoption of certain cultural methods

would aid in the eradication of the weevil. The methods which had for their object the breaking of the food supply of the weevil were embodied in the following recommendations:[3]

(1) The old field should be thoroughly cleaned at harvest, the vines being fed to stock or burned, and the field hogged over.
(2) The potatoes should be banked as far as possible from the old field and from the site selected for the next year's field.
(3) All potatoes on the farm should be disposed of early.
(4) No potatoes or plants from the old crop should be used on the farm and no draw-bed should be planted.
(5) Old potato banks should be cleaned as soon as empty.
(6) Only draws from sources known to be free from the weevil should be used.
(7) The new field should be planted as far as possible from the old field and bank.

It was believed that if these recommendations were carefully followed, the severity of the infestation would be reduced and the weevil finally eradicated.

It soon became evident, however, that the matter of obtaining uninfested planting stock would be difficult. Very few growers could be persuaded to purchase stock from weevil-free sources and naturally it would be unwise to attempt to raise the plants in the infested area. It was decided therefore to supply free plants to all farmers who would cooperate in the eradication campaign; the plants to be raised at Gainesville, fifty-four miles from the infested area. A contract form was drawn up and is shown below.

DUPLICATE

STATE PLANT BOARD
of Florida
Contract to Furnish Sweet Potato Plants

WITNESS:

This Contract of Agreement entered into this........day of.......... .... 19........, between the State Plant Board of Florida, Party of the First Part, and .... of .... Fla., Party of the Second Part, whereby First Party, in consideration of the faithful performance by Second Party of the acts and precautions hereinafter described, agrees to furnish Second Party, free of charge, sweet potato draws as follows:

[3]This original plan of the campaign was outlined by Mr. J. E. Graf, U. S. Bureau of Entomology, after consultation with officials of the State Plant Board of Florida.

Number of Draws	Variety

Said plants or draws to be delivered, charges prepaid by First Party, at ...., Fla., on or about................................., 1920.

And the Second Party hereby covenants and agrees, with reference to all property owned or controlled by him, on which sweet potatoes or yams have been grown, are growing or will hereafter be grown, to

1.—Feed off or rake up and burn all sweet potato vines at time of harvesting the 1919 crop, or as soon thereafter as practical.

2.—Hog off all sweet potato patches (hogs to be penned on field where possible).

3.—Keep old fields free from sweet potato plants and upon discovery of plants therein to forthwith and immediately destroy them, together with the roots or tubers from which they have come.

4.—Prepare 1920 sweet potato fields as far from old potato fields or storage banks as possible.

5.—Destroy all refuse in or around potato banks as soon as they are emptied.

6.—Not bring on premises, or permit to be brought, any sweet potatoes or sweet potato plants from outside sources, other than those to be furnished by the State Plant Board, nor to remove or permit to be removed any planting stock from the premises between.......................... and ...., 1920.

7.—To cooperate with and assist, as far as possible, the agents of the U. S. Dept. of Agriculture and State Plant Board of Florida in all measures looking to subduing, controlling and eradicating the sweet potato weevil, and to this end not to ship any sweet potatoes from areas known to be infested with the sweet potato weevil except after having the same fumigated and certified by an accredited agent of the U. S. Dept. of Agr. or the State Plant Board of Florida.

It is further agreed to by both parties hereto, that

A.—Such modifications to this agreement as may be necessary, may be made by Agents of the Department or Board at the time of signing.

B.—This agreement shall not be binding upon the State Plant Board unless at least 90 per cent of the farmers in the infested territory sign this or similar contracts.

C.—While the Plant Board will endeavor to furnish plants true to name, grown from selected seed and free from injurious insects and diseases, it does not guarantee that they will be so, nor does said Board give any guarantee, express or implied, as to the quality, quantity or value of crops grown from such plants.

D.—This agreement shall terminate Dec. 31, 1920, unless sooner automatically terminated by compliance with all conditions hereof by both parties.

E.—..

Witness: STATE PLANT BOARD OF FLORIDA

By Wilmon Newell,

Plant Commissioner.

Party of the First Part.

Party of the Second Part.

P. O. Address of Second Party..

This Copy for Bureau of Entomology

The infested area was then divided into districts with an inspector placed in charge of each. The growers in each district signed contracts to clean up their farms in return for clean planting stock. The inspectors planned to visit the farms at regular intervals to give advice and to see that the cleaning was properly done.

In order to obtain more accurate information on the area to be included in the eradication experiment, a second survey was made in the Baker-Charlton area later in the season of 1918. During this survey 1,185 properties were inspected.

The two inspections showed quite conclusively that the area to be considered in the eradication campaign could be fairly well defined and would include most of Baker County, Florida, and that portion of Charlton County, Georgia, in the bend of the Saint Mary's River. The known infested area covered about 340 square miles. About 200 square miles immediately surrounding this was considered as a "danger zone." Figure 6 shows the area included in the campaign.

There were naturally errors in the first inspection reports, due principally to similarity of names and the tendency of tenant farmers of a certain class to change their place of abode frequently. The inspections were made under some handicaps since there were few improved roads in the counties, the area being covered by a network of roads and trails used jointly by turpentine operators, lumbermen and farmers. In some parts of the area the farms were adjoining in settlements, while in others they were widely scattered. As the inspectors were not familiar with the roads and people during the first year, it

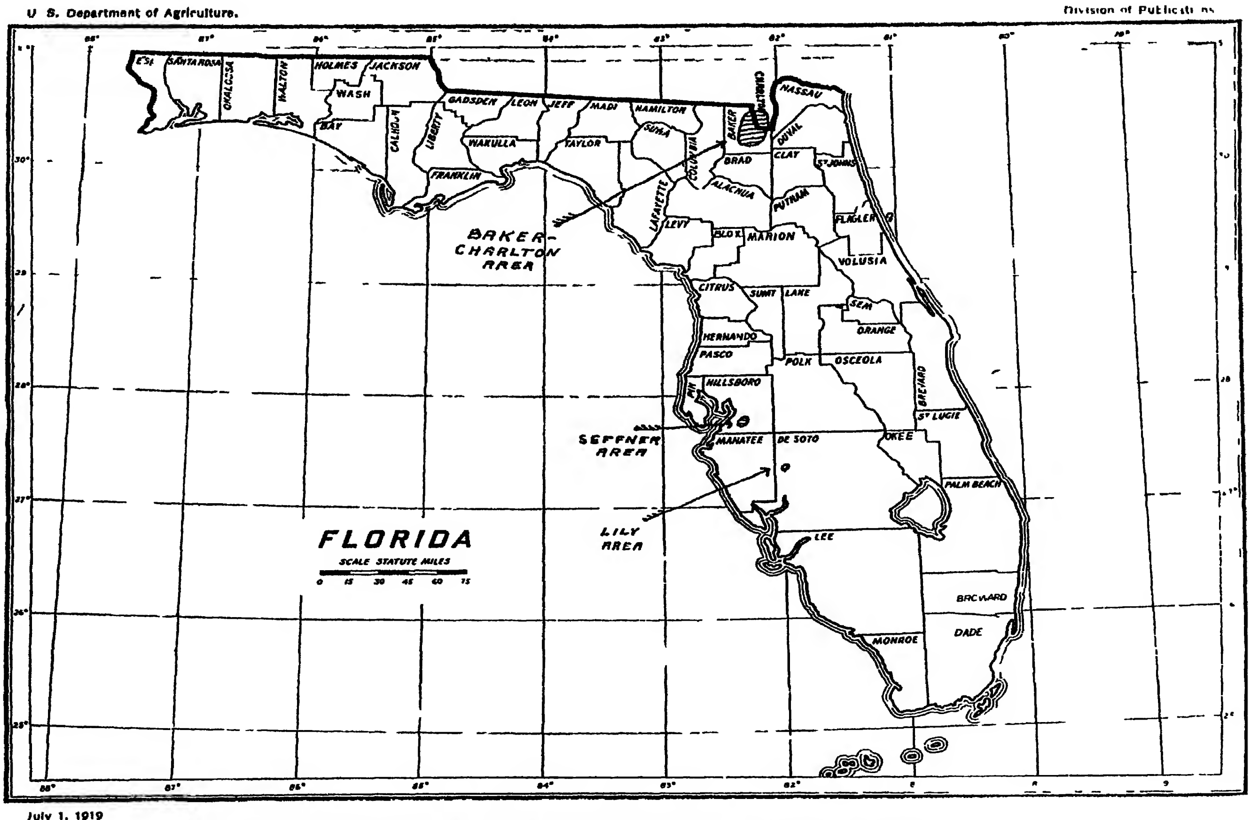

Fig. 6.—Map of Florida showing the Baker-Charlton area, the Seffner area, and the Lily area, the inland areas infested by the sweet potato weevil.

seemed certain that some properties had been overlooked. To remedy this situation a large map of the area was made and the roads charted according to available knowledge. Red thumb tacks were used on the map to indicate the location infested and white thumb tacks to indicate the location of uninfested farms. The tacks were numbered and the name of the owner was listed opposite the number of his farm. This map was kept up to date as the inspectors became more familiar with the territory. This required two or three inspections to obtain correct records on all farms.

One hundred and ninety-six properties were recorded as infested with the weevil and 68 were classified as "doubtful." A farm was listed as doubtful if injury had been found in vines or potatoes which resembled the work of the weevil but where the insect itself had not been found. Farms on which seed had been obtained from known infested farms and those adjacent to severe infestations were also listed as "doubtful."

Signing Contracts

As soon as the second survey was completed, the inspectors visited the growers in the respective districts to obtain the orders for plants and the signatures to the contracts.

Obtaining the signatures on the contracts proved to be anything but a simple matter. Many of those whose farms were badly infested were frankly skeptical of the success of the eradication of any insect after their experience with the boll weevil, and the majority of those whose farms were slightly infested and who had suffered no great loss from the weevil could not see the use of changing their plans in order to fight the insect. Practically all of the farmers who had seed were reluctant to destroy it and depend on the word of strangers that draws would be furnished in time to make a crop. It was especially painful for some who had bred up a strain of seed of which they were very proud to exchange it for the promise of some "just as good." There were many who were not in the habit of making plant beds at all but planted root patches and therefore were very reluctant to start a new method of culture. The extra work involved in carrying out the terms of the contract did not appeal to many of the growers and a few were found who hesitated to sign any sort of contract.

By persistent effort, all but three of the listed growers finally signed contracts and two of the three made verbal agreements. During the first season the contracts called for 880,000 plants of eleven varieties. By this time it had been learned that among the farmers the eradication work had a few enthusiastic supporters and a few actively in opposition, but that the majority were more or less indifferent.

Clean-Up Measures During the First Year (1919)

The signing of the contracts was completed by the last of January. The inspectors then visited each farm in their respective territories and discussed clean-up measures with the farmers, and reported on the conditions existing on each farm. A special report form was used and is here shown:

INSPECTOR'S REPORT ON GROWER

Date of planting.................. ....Date of clean-up..................
Name .... Address ....
Bu. stored.................. Date..................Holding—Selling? ....
Potatoes for home use only—Stock feed? ....
Potatoes rotting? Badly, medium, none..................
Probable amount in storage at time of clean-up.................. bu..................
Disposal: Destroy .... Fugimate ....
Storage House—Bank, No. ....
Is house tight enough to be fumigated? ....
Acreage of new field..................Distance from old field ....
From storage house ....
Has grower burned vines? ....Hogged off field? ....
Kept field clean? ....
REMARKS:
INSPECTOR .... DATE ....

From these reports it was found that there would be many banks of potatoes left in the infested area at draw-delivery time in spite of the contracts which specified disposal of all potatoes at an early date. Every effort was made, therefore, to assist the farmers in selling the potatoes. Fumigation was carried on and certificates issued in accordance with the quarantine regulations.

Toward the end of March the farms were again canvassed and a report (see below) made out on each farm, giving conditions as far as clean-up was concerned and also information concerning draw delivery.

INSPECTOR'S REPORT FORM
Sweet Potato Weevil Investigations

Name .... Address ....Direction..................
Has grower disposed of all eating potatoes?..................If not, how many

on hand and what disposition is to be made of same?..............................

....

Has grower disposed of all seed potatoes?..............................If not, how many on hand and what disposition is to be made of same? ....

....

Has grower raked and burned all emptied banks? ....

Has field been "hogged off"?..............Penned on?..............Open field?..............

Has grower cleaned up vines?..............Burned?..............Fed to cattle?............

Plowed under? ....Can you find green vines in the old field?..............

What is to be planted in the old field?..........................When?..........................

Character of land of new potato field?..

High? .... Medium?.......................... Low? ....

Will grower be willing to care for plants should they come in dry time? .... Has he prepared his new field?..........................

Distance of old field from new one?..................Also from banks?....................

....

REMARKS:

Inspector..Date..................................

Plant Delivery, First Year (1919)

The sweet potato plant orders had been listed as the contracts were signed, according to date of delivery, variety and location. The lists were kept up to date as changes in orders were received. Everything was ready for the expected delivery of draws on April 1.

Unfortunately it was found that the plant beds did not produce as was expected and the required number of plants were not available on the date specified. All concerned realized that the success of the experiment depended on delivering the contracted plants on time, especially the first ones. Many farmers were skeptical about the plants being delivered promptly and it was learned later than a number of draw-beds had been planted to cover such an emergency. The situation was relieved by purchasing plants from the non-infested portion of the State. Suitable plants were difficult to obtain early but a large number were received from southern Florida, so that by the first week in April the more urgent early orders were filled. The rainfall of April was less than half of normal and since some plants were delivered when the land was not in proper condition for setting out the plants, many died. In addition, a sharp frost during the first week in April killed many plants which had just been set out. While there was no obligation to furnish a grower more plants than his contract specified, it was thought advisable to make replacement of plants wherever necessary. Tenant farmers, whether they had signed contracts or not, who moved from the infested area to the danger zone were supplied with plants.

This was done as a safety measure so as to eliminate, as far as possible, the planting or movement of planting-stock not known to be weevil-free. Plant delivery continued until the latter part of June, 293 farmers receiving 1,175,000 plants, 295,000 in excess of the contract number.

Farmers' Clean-Up Measures

At the time the last plants were being delivered another report was made as to conditions on each farm. A copy of the form on which this information was reported follows:

INSPECTOR'S FIELD REPORT FORM

Grower's name ....

Is grower satisfied? ....

Does he need draws? ....

Are draws growing? ....

How far is new field from old? ....

How long were plants "heeled in"? ....

How far from bank? ....

Potatoes on hand ....

What is grower's complaint? ....

REMARKS:

Inspector..Date ....

As soon as the last plants were delivered and the reports made, a careful inspection of the cooperators' farms was made.

It was found that on only a very few farms had adequate clean-up measures been taken. On the majority of farms some attempt had been made to live up to the contract but on a number practically nothing had been done. It was evident that few of the growers realized how carefully the clean-up measures must be carried out in order to be effective. There were instances where men with several banks of potatoes had carefully cleaned all banks at the house but left uncleaned a single bank at the field with a bushel or so of infested potatoes in it. Some had carefully raked all the dead vines off the surface of the field and burned them but at the time of inspection the field was covered with volunteer plants from the buried vines and roots. Some growers had planted their weevil-free draws as far as possible from the old field and then cut vines from the draw field and planted them adjacent to the old field where weevils were certain to be present. On a few farms it was found that there had been no departure from the old methods, drawbeds and root patches even being planted.

The inspectors assumed at once the responsibility of cleaning the farms and raked and burned old banks and dug and burned

volunteer plants in the fields wherever they thought it would result in bringing about the greatest reduction in weevils. This work reduced the weevil population and, while it probably resulted in eradication on only a few farms, because of the lateness of the season, it made the following year's work less difficult. Probably the greatest value of this summer's clean-up was the demonstration to the farmers of how a bank should be cleaned and the fact that it gave to all concerned in the eradication experiment a definite idea of how much labor was required to properly clean a field and storage bank. As the inspectors did the work themselves, it also impressed the grower with the fact that the cooperating organizations were in earnest in their endeavor to eradicate the weevil.

A statement of the condition of each farm and of what work was done on it was written on a 5 by 8 card and filed with the other reports on that particular farm. No report form was used, but the following report will illustrate the material filed:

"B. G. Fish, Glen Saint Mary. 7-8-19. Hendry & Jarrell, Inspectors.

"Grower claimed that it has been too wet to burn the banks. We cleaned them thoroughly. We found the weevil in the banks. Grower is willing to do all that he can to help us. His new field is about one-half mile from the old field and about the same distance from the old bank."

Inspection of Danger Zone

As the season advanced, it became necessary to stop the clean-up work and reinspect the danger zone. Four hundred and one properties were inspected and no weevils found, indicating that there had been no weevil spread during the year. At this time also the properties of farmers who had been in the infested area in 1918 and moved to non-infested parts of the State were inspected. These farmers had disposed of their potatoes before moving and had been supplied with weevil-free plants. The fact that no infested properties were found indicated that the weevil had not been carried out of the infested area.

After the completion of inspection of the danger zone the cooperators were again solicited to sign contracts for the second year's campaign. This phase of the work was taken up at this time rather than after the harvest-time inspection. It was felt that the hurried harvest-time inspection might result in

failure to detect infestation in some instances. This would not necessarily indicate absence of the weevil but merely reduction in numbers. The farmer, however, might object to signing the contract under such circumstances. In other words, unless actual infestations were found the difficulties in obtaining the signed contracts would be greatly enhanced. It was therefore determined to make the effort prior to fall inspection rather than after. The difficulties in securing signed contracts were further increased by the fact that plant deliveries under contract the prior season had not corresponded with weather conditions suitable for field planting, with consequent inconvenience to the farmers. The effort was made, however, with the final result that all affected farmers, except three, "signed up."

Fall Inspection, 1919

The fall inspection of the infested area was started late and was necessarily hurried. Some farms were not inspected until two or three weeks after harvest and the weather and stock had left little material for inspection above ground in the fields. The storage banks were full and the chance of finding a slight infestation would not justify opening them. On the back of each report form the inspector made a sketch of the farm giving the location of the 1918 fields in relation to the 1919 banks and fields. This information, together with the previous reports, gave a good idea of how carefully the clean-up measures had been carried out.

During this inspection the weevil was found on 75 of the original 196 infested properties and also on 15 properties on which it had not been previously found, although some of the 15 had been carried as doubtful.

Results of the First Year's Campaign

The first year's work proved the value of the original cultural practices recommended. While the reports of the fall inspection could not be accepted as representing accurately the number of infested and weevil-free properties they did indicate that the population of the weevil over the entire infested area had been greatly reduced and that eradication had been accomplished on some properties.

It also showed that a number of changes had to be made in the methods of procedure if weevil eradication over the whole

area was to be accomplished. It was evident that each farm must be considered as a separate experiment and handled as the characteristics of the farmer and the conditions affecting eradication on the farm demanded. It was realized, too, that the clean-up of the sweet potato fields and storage banks must be supplemented by hired labor under the supervision of the inspector. Furthermore, the dates of delivery and numbers of draws given on the contracts were to be considered as approximate only and delivery made as far as possible under favorable weather conditions.

Second Campaign, 1920

At the beginning of the second year some changes were made in the lists of growers cooperating. A few were dropped because they had grown no sweet potatoes on their own farms during the 1919 season but had cropped on shares with neighbors, a few had moved and their places were to be vacant in 1920, and some whose places had been considered doubtful in 1919 were now on the basis of inspection and general history, considered clean. Several new contractors were added to the 1920 lists because of information collected during 1919. A total of 212 contracts were signed, 90 representing infested and 122 potentially infested properties.

During the first year's work it was found that some farms required much more attention than others, owing to the conditions on the farm and surrounding farms and the personal characteristics of the owners. It was also discovered that there were some properties which were much more important from the eradication standpoint than others. The owners of these places were successful potato growers who always raised good crops of sweet potatoes and had plenty of draws or vines for planting. Their less successful neighbors depended on these men for planting-stock and potatoes when their own efforts were unsuccessful. Occasionally there would be a grower who had a special strain of seed which was locally popular and whose draws and vines would be in demand. The histories of the various farms showed these places to be distributing points for planting-stock, and, when infested, for the weevil. In redistricting the infested area these points were considered in attempting to make an equal division of work and responsibility. Lists of the cooperators in each district were made and given

to the inspectors and two copies of each list were kept on file in the office.

On the first list the number of banks and number of bushels of sweet potatoes at the time of harvest was recorded. At each farm visit by the inspector the number of bushels in each bank was noted and when all the sound potatoes were utilized, the waste potatoes and pine straw were burned and the place was crossed off the list. This method gave assurance that no bank would be neglected or farms missed.

In the second list in the first column were recorded the acreage and number of fields. In the second column was recorded whether or not the field had been "hogged off." Here also were noted the number of hogs in the field, the length of time they were there, and whether or not they were penned in. This information was obtained in order to determine how effective a part the hogs would play in the clean-up program. The first year's records showed plainly that the hogs were indifferent assistants unless compelled by hunger to concentrate on the work assigned. In the third column was noted the crop to follow potatoes and in the last column what clean-up measures were taken by the grower or inspector.

As soon as the lists were prepared the inspectors visited all contractors to determine the number of bushels of sweet potatoes remaining and to collect data on the condition of the old fields. On this visit, as on all others, the inspector urged the grower to select a safe site for his new field. The allotted funds for the work would not permit the cleaning of all fields by the inspectors, so a selection of the most important fields to be cleaned was necessary.

The fields selected were listed in the order in which they were to be cleaned. Several criteria governed the arrangement of the list; first, the importance of the field to the whole eradication project: second, the assistance which could be expected from the grower; and, third, the time at which the field was to be planted to a new crop. The fields which had already been planted to sugar cane or garden crops were not considered.

Each inspector hired a force of unskilled laborers, and field cleaning continued as the weather permitted until the middle of March. The harvested fields were first plowed and harrowed to bring the buried vines and potatoes to the surface and these were raked into piles (see Fig. 7) and burned with the aid of kerosene and pine knots. It was found that the time required to

clean an acre varied according to the type of soil, the time of digging, and the effectiveness of "hogging off." On some places, fortunately, little work was necessary. During this season a total of 76 acres were cleaned at an average cost of $13 per acre.

Plant delivery began early in April and continued until late June. Every effort was made to deliver plants to the grower after a rain when his land was ready. In some cases where the draws did not grow well, vine cuttings were delivered for later plantings.

Fig. 7.—Cleaning up sweet potato field after harvest.

In the season of 1920 and during the rest of the eradication experiment no further difficulty was experienced in obtaining draws when needed. With draws readily available the inspectors had more time during plant delivery to keep a close watch of the storage banks and last-season fields. It was found that although the fields were carefully cleaned, a few potatoes and vines were left, resulting in a growth of volunteer plants. As time permitted from April 1 to July 1, the fields were visited and these volunteer plants were dug up and destroyed, together with the roots from which they grew.

During the summer months inspection was carried on in the danger zone and on properties in the infested area which were not included in the eradication campaign. On these places were left-over draw-beds, root patches and, on many places, storage

banks, all containing potatoes from the previous year's crop, which provide excellent material for summer inspection. In addition, the volunteer plants in the fields afforded good material for inspection. No infested properties were found in the danger zone but 21 new infestations were found in the infested area.

At harvest time the properties of the cooperators were inspected and the weevil found on 44 of them, thus making for the season of 1920 a total of 65 infested farms.

The Importance of Farm Histories

The continuance of a farm in the eradication experiment did not depend altogether on whether or not the weevil had been found on it but on its location and owner and its entire history of sweet potato production. It was found that careful farm histories could almost be relied upon for predicting weevil infestations. Each report made on a farm during the work was filed under that individual farm and as every operation was recorded, the history of each farm was quite extensive. In order to reduce the number of individual reports, a printed form 8 by 11 inches was devised on which was summarized the eradication history of each farm. This summary gave the name of the grower, the district, the location in the district, the character of inspections made, the source of seed, the acreage of fields, the number of bushels of sweet potatoes stored, the relative locations of the fields and banks and, in detail, the eradication work carried on during the years 1918-1919 and 1920. Approximately three hundred of these forms were filled out and aided in determining which farms could be safely dropped from further consideration. In addition, they pointed out the relative importance of the remainder, and the probable cause of the more persistent infestations.

Third Campaign, 1921

At the beginning of the 1921 campaign it was decided that it was safe to drop some of the cooperators, reducing the number of farms under contract to 190, 65 of which were infested and 125 considered dangerous. This made an average of about 47 farms for each of the four inspectors.

At this time matters were complicated by two or three growers in the Georgia district who decided that the weevil was not present on their farms and who refused to cooperate further.

While the weevil had not actually been found on their places in 1920, the histories of their farms made it unsafe to drop them. The growers' only objection to cooperation was connected with the furnishing of draws. They wanted to raise their own plants. In some districts the work had not advanced to the stage where it was considered safe to permit draw-beds and root patches to be planted. In addition it was considered unsafe to offer seed potatoes instead of plants for the entire area, as inspectors were not available to properly supervise the distribution and bedding of the quantity necessary.

It was finally decided to give the cooperators in Georgia their choice of plants or seed potatoes and to keep the old rules in effect in Florida. It was certain that this would mean the adoption of the same system over the entire area the following season but by that time it was expected that the number of infested farms would be reduced to the point where the furnishing of seed potatoes would probably be safe.

Field and storage bank cleaning was carried on as in 1920. A survey of the farms was made, using the following report form:

Name .... Date .... Inspector ....
Address ....Distance .... Direction....................
No. Bu. ....Dirt Bank.................... Dirt or Board Bank....................
Storage House ....
Has field been hogged off?.................... Crop to be planted....................
Date .... Additional Notes ....
....
....
....

The farms were then listed in order of their importance to the eradication campaign and as many of the fields as possible were cleaned before planting time.

During February 83 bushels of seed potatoes were delivered to the contractors in Georgia. The location of the plant beds had been agreed upon before delivery and the seed was bedded immediately so that there was no danger of its becoming infested during storage.

Plant delivery in the Florida area began in April and continued into June; 694,550 draws and 60,000 vine cuttings being delivered during this period.

As each inspector had fewer farms under his observation than previously, more attention could be given to each and the old fields were visited frequently and kept free from volunteer plants.

Early in July inspection of the danger zone and all properties in the infested area except those of the contractors was begun and followed until the last of September. Seventeen new infestations were found in the infested area but no trace of the weevil found in the danger zone. Beginning October 1, the entire infested area was again carefully inspected, the more important places receiving two inspections. Twenty-seven infestations were found during this survey, bringing the total number of infestations for the year 1921 to 44.

With an increased number of trained men available, the 1921 inspections, both summer and fall, were the most thorough since the beginning of the experiment.

Fourth Campaign, 1922

In planning the work for 1922 a survey of the situation made considerable change in procedure seem advisable. From the records of the farms it was decided to continue operations with only 58 properties, 44 of which were infested and 14 "doubtful." This would make it possible to give more time to each farm and it was hoped that this added effort would result in cleaning up most of the infestations which had been so persistent. It was felt that the farmers thus dropped from the cooperative experiment would revert to their old methods of growing sweet potatoes and that any slight infestations overlooked would increase rapidly in intensity. With the added inspection, however, it was reasonably certain that these infestations would be discovered before there was an opportunity for their spread to the adjoining farms.

All of the cooperative agreements were made in the early fall and clean-up operations started immediately, several fields being cleaned at the time of digging. On these farms the vines were cut off close to the ground, removed from the field and exposed to the range cattle and hogs. Later the dried remnants were raked up and burned. The remainder of the fields were cleaned as in previous years, all work being completed by the end of February. During the first week in March weevil traps were placed in the cleaned fields. The traps were merely sweet potatoes placed on the ground and protected from rats and rabbits by shingles which were stuck in the ground around them. The traps were put out at the rate of about twenty to the acre. A total of 99 weevils were taken from them during the spring.

While there is no evidence that the weevil could locate its food at any great distance, collections at the traps indicated that when a weevil located a sweet potato it would crawl under it and remain there feeding and laying eggs. There is a question as to what percentage of the weevils in a field may be collected at traps, but each weevil collected in this way lessened the chance of infestation and also, in the absence of good material for inspection, gave positive evidence that the property was infested. Failure to collect weevils at traps, however, was not accepted as evidence that the farm was uninfested.

During 1922 the cooperating farmers were given the choice of having supplied to them seed potatoes or draws as a source for planting-stock. One hundred and eighty-five bushels of seed were delivered during February and bedded on the farms under the supervision of the inspectors. As April was exceptionally dry, practically no draws were delivered during that month but 58,250 draws and 73,850 vine-cuttings were delivered in May, June and early July.

After the fields had been cleaned and the traps put out, the fields were visited at intervals and the traps examined and volunteer plants destroyed. The operations on each farm were carefully recorded day by day on an 8 by 10 inch sheet. About one quarter of the sheet was taken up by a diagram of the farm giving the location of the 1921 fields, banks and plant beds, if any. When the sites of the 1922 fields were selected these were added, giving distances. Then under the headings "1921 Banks," "1921 Fields," "Traps" and "1922 Planting" more complete details were added.

The following items show the amount of work conducted on one farm which was properly cleaned at harvest:

"GROWER.............................. .... 1921 Field, ½ Acre

Date		Date	
12-5-21,	Cleaned at harvest; vines rolled off	4-10,	No volunteers
		4-14,	No volunteers
12-8-21,	Potatoes dug	4-18,	1 volunteer
1-8-21,	Vines burned	4-25,	No volunteers
1-23,	Field recleaned	4-27,	No volunteers
2-1,	Hogs on field 12-17 to 2-1	5-5,	No volunteers
3-16,	No volunteer plants	5-8,	No volunteers
3-21,	No volunteers	5-14,	No volunteers
3-23,	No volunteers	5-22,	3 volunteers
3-26,	1 volunteer	5-29,	4 volunteers
3-28,	8 volunteers	6-13,	No volunteers
3-30,	No volunteers	6-22,	No volunteers
4-4,	No volunteers	6-28,	No volunteers
		7-5,	2 volunteers

TRAPS IN FIELD

Date		
1-14-22,	2 female weevils, 1 male	March 3, 6, 8, 14, 16, 21, 23, 26, 28, 30; no weevils collected
1-17,	None collected	April 4, 10, 14, 18, 25, 28; no weevils collected
2-2,	1 female weevil, 1 male	May 5, 8, 14, 22, 29; no weevils collected
2-7,	1 female	June 13, 22, 28; no weevils
2-13,	None collected	July 4, Took up traps
2-20,	None collected	
2-22,	1 male	
2-24,	None collected	
2-26,	None collected	
2-28,	None collected	

1921 BANKS

Date	Potatoes stored
12-17-21,	20 bushels
2-23-22,	None
2-24-22,	Bank burned

1922 PLANTING

Date	
2-22-22	Delivered and bedded 2 bushels of variety Red Providence
3-30,	Draws coming up
5-4,	First draws planted

The notes taken on a field and shown below, in which sugar cane had been planted directly after potato harvest without cleaning or "hogging off," give an idea of the quantity of material normally left in the ground after harvest.

GROWER ....1921 Field, ½ A.

Date	
10-16-21,	Owner has dug crop and planted cane. Dug vines from between cane rows and burned.
3-11-22,	Cane just cultivated. Picked up ½ bu. potatoes.
3-14,	Picked up peck of small potatoes just plowed up.
3-24,	Picked up 1 bu. potatoes.
4-4,	Few volunteer plants destroyed.
4-10,	Dug 1½ bu. volunteers and potatoes. Found one potato containing 21 weevils.
4-7,	Dug 1½ bu. small pieces of potatoes and vines.
4-20,	Few volunteers. Found 1 potato containing 65 larvae, 18 pupae and 4 adults.
4-22,	½ bu. volunteers. Most of these from small potatoes buried deep.
4-26,	Just cultivated. Picked up 16 potatoes.
5-6,	½ bu. volunteer plants.
5-8,	1 peck volunteer plants.
5-15,	1 peck volunteer plants.
6-1,	½ bu. volunteer plants.
6-7,	31 volunteer plants.
6-14,	30 volunteer plants.
6-20,	25 volunteer plants.
7-3,	8 volunteer plants.
7-10,	13 volunteer plants.
7-18,	10 volunteer plants.
7-25,	5 volunteer plants.

Since the period covered by this field record extended from October to the following July, it is easy to understand how readily the weevil may be carried over winter under Florida conditions.

Inspections in 1922 for locating infested farms were started in May and continued until late December. The same territory was covered as in previous years. A total of 13 infested properties was found. One was a new infestation. Cooperative arrangements were made with the owners of the 13 infested farms and with 17 others whose places were regarded with suspicion. Practically all the fields were cleaned at harvest time, the vines being taken from the fields and later burned.

Fifth Campaign, 1923

With the reduction in the number of cooperating farmers, it became possible to even give closer attention to the individual farms. As the fields may be cleaned most effectively and with the least effort at harvest time, the inspectors made arrangements to be present at the time of digging in order to supervise field cleaning. Trap potatoes were put out early on the infested places and frequent visits made to the fields to dig volunteer plants. The seed was distributed and bedded on the farms in February as in the previous year and the plants delivered later.

Inspection and search for volunteer plants and left-over potatoes was carried on continuously from early May until late December and only one infested property was found. This farm and the adjacent one were carefully cleaned at harvest time and contracts were arranged with the owners for the following year.

Inspections January 1, 1924 to June 30, 1927

Little clean-up work was necessary in the Baker-Charlton area in 1924. One inspector was kept at Macclenny to look after the eradication work on the farms of the two remaining contractors. All time not needed on these farms was spent listing the quantities of sweet potatoes stored on the farms in the infested area and part of the danger zone. In addition, trap potatoes were put out on 60 farms and were examined twice a week.

From the record of stored potatoes, lists were made for bank inspection during April, May and June. Since there is little chance of finding a slight infestation in a bank containing a large number of sweet potatoes, the farms were visited at a time

when it was estimated that there would be not more than five bushels of potatoes in the storage banks. By this means a very careful inspection record was kept not only on all the farms under suspicion, but on all the potatoes in the area. This same system of bank inspection has been followed since.

Beginning in July of each year and continuing through September, the farms were visited, and the storage banks, drawbeds, root patches and old fields were examined. Practically all the growers had planted their new fields by this time and the inspectors could cut as much material in the abandoned plant beds as was necessary to make a thorough inspection. As the inspection reports were received, the farms on which there was suitable material available for another inspection were listed for reinspection. In the fall inspection all potatoes or potato plants on a farm were inspected. The fall inspection was considered the most important, as there was always an abundance of good material for inspection on all farms at this period, and if the weevils were present they would be in their greatest numbers. Two inspectors worked together and their inspections averaged about two hours to the farm. Farms which were regarded with suspicion were inspected two or three times.

A new report form, shown below, was used which gave the date of inspection and kind of material examined.

FARM INSPECTION REPORT

Grower .... Address ....
Inspector .... Date ....
Inf. ....
Drawbed ....
Root patch ....
Bank ....
Field ....

Source of Seed

From this report the value of the inspection could be accurately judged since it included all the material upon which the weevil would collect and indicated the length of time this material was exposed to weevil attack.

No infestations were found in the Baker-Charlton area in 1924, and subsequent inspections up to and including June, 1927, have failed to bring to light any indication that the pest is present in this area. The progress of the eradication campaign is shown in the following table:

SUMMARY OF ERADICATION CAMPAIGN AGAINST THE SWEET POTATO WEEVIL IN THE BAKER-CHARLTON AREA, 1918-1927

Years	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927 (June)
New infestations	196	15	21	17	1	0	0	0	0	0
Continued infestations		75	44	27	12	1	0	0	0	0
Total	196	90	65	44	13	1	0	0	0	0
Properties carried as doubtful	68	122	125	14	17	1	1	0	0	0
Total properties included in experiment	264	212	190	58	30	2	1	0	0	0

WEEVIL ERADICATION EXPERIMENTS AT SEFFNER

In April, 1921, Mr J. Harvey Henderson located the weevil on several farms in the vicinity of Seffner, Hillsborough County, Florida, about 12 miles inland from Tampa. While it was known that the coast of Hillsborough County was infested, it was not known how far inland the infestation extended and there was therefore a possibility that the infestation at Seffner might be of recent origin and limited extent. Proceeding on this supposition, it was considered advisable to attempt to eradicate the weevil on these farms and thus prevent its spread to the Plant City and Polk County trucking areas.

The biological laboratory which had first been located at Macclenny and was subsequently moved to Daytona, was now transferred to Tampa where it would be in close proximity to the new infestation. Later surveys indicated that the infestation was of comparatively long standing and that the weevil was generally scattered over the eastern three-quarters of the county. Inspectors were assigned to the problem to determine if the weevil could be eradicated on certain groups of farms in the midst of this infested area by the use of the same methods which were giving such successful results in the Baker-Charlton area as a whole. It was soon learned, however, that the eradication of the weevil here would be much more difficult than in the Baker-Charlton area. The territory was a thickly populated trucking district with only about 13 acres of cultivated land to the farm. This made it impossible for a grower to make his new planting at a safe distance from the one of the last season and the situation was even less favorable when the neighbors' fields were considered. The growth of volunteer plants was so persistent.

owing to the mild winters and methods of cultivation, that it was not only necessary to clean the field of the last season's crop but those of several preceding years. It was also discovered that the wild morning-glory *(Ipomoea pandurata* L.) was quite common over the entire area and although it was seldom found infested, it probably furnished food for the weevils during seasons of the year when there were few cultivated sweet potatoes. The seaside morning-glory vines planted around dwellings as ornamentals, were found to be infested on several farms.

From three years' experiments in this area it was concluded that while weevil eradication might be possible under the existing conditions, it would require the expenditure of more money than the benefits derived would justify, especially in view of the fact that the area in all probability would become reinfested from the morning-glory growing along the nearby coast.

Weevil Eradication Experiments at Lily

In 1920 an inland infestation of the sweet potato weevil had been reported at Lily, a small settlement in southern Florida near Arcadia. During the summer of 1921 a survey of that locality was made and 110 farms were inspected in an area of about 100 square miles. This group of farms, because of the type of country surrounding them, was more or less isolated. The weevil was found on twenty-three farms. All available information indicated that the weevil had been introduced on one farm early in 1919 in sweet potato vines brought from the coast. From this farm the weevil had been distributed to others in planting-stock. The conditions here were similar to those in the Baker-Charlton area, except that due to milder climate sweet potatoes grow at all seasons of the year.

It was decided to attempt the eradication of the weevil on the infested farms and an inspector was transferred to Lily in the fall of 1921 to take charge of the experiment. Practically the same methods which were used in the Baker-Charlton experiment were to be used here. The old fields and banks were to be cleaned and the fields kept free from volunteer plants and trapped with potatoes. A change was made, however, in the manner of obtaining weevil-free planting-stock. Earlier observations had shown that sweet potato roots in the field became infested either through being exposed or by the weevil entering them through the stem, as the weevil was not known to dig

into the soil in search of food or to lay its eggs. This suggested the possibility of selecting the seed from the infested field before digging and then bedding it at a site selected as far from the infested field as the size of the farm would permit. The new field would then be planted adjacent to the plant bed and thus limit the chance of infestation. The usefulness of this method lay in the fact that its cheapness would make its permanent adoption by the farmers probable.

Only farms on which the weevil had actually been found were included in the experiment and these were dropped as soon as inspections indicated that they were weevil-free. The entire area was inspected at least twice a year.

Of the original twenty-three infested farms, twenty-two were evidently freed from the weevil by the first year's work. One was found to be still infested early in 1923 and seven new infestations were found during that year's inspections. Eradication measures were undertaken on these eight farms during 1923 and since that time repeated inspections have failed to disclose the presence of the weevil.

Summary

In 1918 an experiment was undertaken in Baker County, Florida, and Charlton County, Georgia, to see if it would be possible and practicable to eradicate the sweet potato weevil in a given area by the use of certain cultural methods without restricting the growing of sweet potatoes.

The cultural methods employed were directed at the two weakest points in the life of the weevil, namely, (1) the limitation of its food to sweet potatoes and closely related morning-glories and (2) its slow spread by natural means. The methods adopted are outlined below:

1. Clean the old field thoroughly at harvest.
2. Store sweet potatoes as far as possible from the old field and the site selected for the next year's field.
3. Dispose of all sweet potatoes on the farm early.
4. Clean sweet potato banks as soon as empty.
5. Use no sweet potatoes or plants from the old crop on the farm and plant no drawbed.
6. Plant draws for the new crop from sources known to be weevil-free.
7. The new field should be planted as far as possible from the old field and bank.

The preliminary survey showed that the morning-glory in the Baker-Charlton section was not a factor and that therefore the only host plant to be considered was the sweet potato. While it was not known exactly how far the weevil would travel there was no evidence of its spread by flight and the distance it would crawl must naturally be limited. The chance of a newly planted field remaining uninfested therefore (provided that the planting-stock was clean) would depend on its distance from the sources of infestation and the intensity of these infestations.

The plan of operation was to clean completely the fields of all crop remains at harvest, to dispose of the sweet potatoes early in the winter and to burn the waste potatoes left in the storage bank. To bring about an additional break in the food supply of the weevil, plant beds were not permitted on infested farms, the planting-stock to be obtained from weevil-free sources. The new field was planted as far from the possible source of infestation as the size of the farm would permit.

Contracts were made with the affected growers whereby they were to be supplied with weevil-free draws on condition that they carried out the cultural methods outlined, under the supervision of the inspectors who were conducting the experiment. While some of the growers met the conditions specified, the cooperation as a whole was not entirely satisfactory and it was necessary that the inspectors undertake the clean-up measures. In spite of the unsatisfactory cooperation, steady progress was made and the number of infested properties decreased until in the fall of 1923 after four seasons' work only a single infestation was found and since that time careful inspection each year has failed to disclose the presence of the weevil in the Baker-Charlton area. During the course of the experiment 250 farms were freed from the weevil.

While the eradication experiment in the Baker-Charlton area was being carried on, inland infestations were found at Seffner, Hillsborough County, and Lily, DeSoto County, Florida. At Seffner an eradication experiment was carried on with a group of infested farms, but because of existing conditions in that locality it was decided that eradication would not be economically feasible, so the experiment was discontinued. A survey of the Lily area indicated that the infestation was of recent origin and was limited to twenty-three properties in an isolated community, including about one hundred farms. Eradication work was started there in 1922 and the same methods used as in the Baker-

Charlton experiment, except for the fact that draws were not furnished. Clean seed to supply plants for the next crop was selected from the growing field and bedded on the farm at a safe distance from sources of infestation. The twenty-three original farms and seven additional infestations discovered later have apparently been freed of the weevil.

CONCLUSIONS

The strict enforcement of the existing quarantine regulations by the State Plant Board has been very effective in retarding the spread of the sweet potato weevil in the State of Florida. The spread of the weevil in the seaside morning-glory and the increased use of automobile transportation creates a situation which will be difficult to combat. The principal danger lies in the transportation inland of infested seaside morning-glory vines to be grown as ornamentals, and the transportation of infested sweet potatoes or plants to uninfested portions of the State by automobile. In each importation of this kind the weevil may become established; and because of the common custom of selling or giving away planting-stock, the original infestation would be a distributing point. If the grower does not take the necessary precautions to protect his crop, it is logical to assume that the sweet potato weevil will invade the inland districts.

The eradication experiments have shown that the elimination of the weevil in local infestations seems entirely feasible, provided the growers concerned will cooperate and the situation is not complicated by the presence of a considerable quantity of infested morning-glory. Especially is this true in the northern part of Florida, since the farms are of sufficient size to permit planting new fields at some distance from sources of infestation and the winter weather is, ordinarily, severe enough to destroy exposed crop remnants. Further to the south eradication would become more difficult, owing to the milder winter weather and the fact that the small size of the farms in the trucking areas would make it impossible to plant new potato fields to a safe distance from infestation sources.

In any case, where the eradication of the weevil is to be attempted, a careful survey by trained men should first be made to obtain information on the extent and history of the infestation. With this information at hand, plans can be made to cover the situation, following in a general way the methods used in the Baker-Charlton area.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

RULES AND REGULATIONS MADE BY THE STATE PLANT BOARD PURSUANT TO THE FLORIDA PLANT ACT OF 1927

In accordance with subsection 15 of Section 5 of the Plant Act of 1927 all regulations, rules, public notices and other official acts of the State Plant Board which should be given publicity may be published in an official organ of the Board which the Board is authorized to issue at regular intervals to be determined by the Board. The Board has authorized the publication of a Monthly Bulletin in which hereafter all rules, regulations, etc., will appear. All rules and regulations passed by the Board have the full force and effect of law.

RULES AND REGULATIONS ADOPTED AUGUST 15, 1927

Rule 52. Every person in this state who owns or has in his possession honey bees or beekeeping equipment shall upon the request of an inspector of the State Plant Board furnish said inspector a complete inventory of all honey bees and beekeeping equipment owned or possessed by him and shall point out same to said inspector so that the honey bees and beekeeping equipment so owned or possessed may be properly inspected and reported by said inspector.

NOTICE OF PUBLIC HEARING

Gainesville, Florida,
Aug. 15, 1927.

Notice is hereby given that the State Plant Board of Florida will hold a public hearing at its office in Tallahassee, Florida, on September 12, 1927, at ten o'clock A. M., at which time and place consideration will be given to the enactment and promulgation of rules and regulations applying to the movement into and within the State of Florida of plants and plant products coming under the provisions of the Florida Plant Act of 1927, Chapter 12291, Laws of Florida.

At the same time and place the Board will, under the provisions of the Bee Disease Law of 1927, Chapter 12050, Laws of Florida, also give consideration to rules and regulations governing the shipment into or within the State of honey bees and beekeeping equipment.

All persons interested are invited to be present, either in person or by attorney.

J. T. DIAMOND,
Secretary.

P. K. YONGE,
Chairman.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEPARTMENT REPORTS

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S SUMMARY

MONTH ENDING JULY 31, 1927

SHIPS AND VESSELS INSPECTED:

From Foreign Ports—			
Direct	188		
Via U. S. Ports	50		
Total		238	
From U. S. Ports other than Florida		155	
From Florida Ports		54	
Total			447

NUMBER OF PARCELS INSPECTED:

Arriving by water:		
Passed	32,218	
Treated and passed	51,894	
Returned to shipper	325	
Contraband destroyed	115	
Total		84,552
Arriving by land—express, freight, wagon, etc.:		
Passed	1,103	
Treated and passed	0	
Returned to shipper	87	
Contraband destroyed	25	
Total		1,215
Arriving by mail:		
Passed	43	
Treated and Passed	0	
Returned to shipper	1	
Contraband destroyed	2	
Total		46
GRAND TOTAL OF PARCELS INSPECTED		85,813
Number of parcels on hand pending determination as to final disposition		0

BEE DISEASE ERADICATION

REPORT FOR MONTH ENDING JULY 31, 1927

Number of apiaries inspected	112
Number of colonies inspected	2,849
Number of apiaries infected with American foul brood	8
Number of colonies infected with American foul brood	13
Number of colonies destroyed	13
Number of apiaries infected with European foul brood	1
Number of colonies infected with European foul brood	1
Number of colonies destroyed	1

NURSERY INSPECTION DEPARTMENT

Nursery Inspector's Summary for Month Ending July 31, 1927

Number nurseries inspected		646
Quantity of stock inspected:		
Citrus	9,141,772	
Non-citrus	8,708,313	
Total		17,850,085

DEPARTMENT OF CITRUS CANKER ERADICATION

Report on Eradication Work in Cooperation with the Bureau of Plant Industry, United States Department of Agriculture, for Month Ending July 31, 1927

Citrus grove trees inspected	1,157,735
Citrus nursery trees inspected	133,026
Inspectors employed on citrus canker eradication	32
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

General Summary

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15,158
Nursery trees found infected since May, 1914	342,260
Number properties found infected to July 31, 1927	513
Properties declared no longer "danger centers"	512
Properties still classed as actively infected July 31, 1927	1

Department of Citrus Canker Eradication (Report Continued)

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to July 31, 1927:

914		1915		1916		1917		1918		1919		1920	
ın.		Jan.	306	Jan.	86	Jan.	14	Jan.	0	Jan.	0	Jan.	0
ɜb.		Feb.	165	Feb.	21	Feb.	4	Feb.	1	Feb.	0	Feb.	0
ar.		Mar.	444	Mar.	49	Mar.	9	Mar.	1	Mar.	1	Mar.	0
pr.		Apr.	408	Apr.	49	Apr.	169	Apr.	2	Apr.	1	Apr.	0
ay	108	May	1042	May	338	May	52	May	1	May	1	May	0
ın.	160	Jun.	772	Jun.	450	Jun.	45	Jun.	10	Jun.	0	Jun.	0
ıl.	275	Jul.	651	Jul.	349	Jul.	39	Jul.	0	Jul.	0	Jul.	539
ıg.	1313	Aug.	1345	Aug.	219	Aug.	30	Aug.	0	Aug.	1	Aug.	1
pt.	767	Sept.	618	Sept.	124	Sept.	6	Sept.	0	Sept.	0	Sept.	0
t.	565	Oct.	214	Oct.	451	Oct.	2	Oct.	0	Oct.	0	Oct.	0
ɔv.	773	Nov.	494	Nov.	131	Nov.	1	Nov.	0	Nov.	0	Nov.	0
c.	366	Dec.	256	Dec.	27	Dec.	1	Dec.	0	Dec.	0	Dec.	0
tal	4327	Total	6715	Total	2294	Total	372	Total	15	Total	4	Total	540

1921		1922		1923		1924		1925		1926		1927	
Jan.	0	Jan.	0	Jan.	1	Jan.	0	Jan.	0	Jan.	0	Jan.	0
Feb.	0	Feb.	0	Feb.	1	Feb.	0	Feb.	0	Feb.	0	Feb.	0
Mar.	0	Mar.	0	Mar.	2	Mar.	0	Mar.	5	Mar.	0	Mar.	0
Apr.	0	Apr.	0	Apr.	3	Apr.	0	Apr.	0	Apr.	0	Apr.	0
May	0	May	585	May	2	May	0	May	0	May	0	May	0
Jun.	0	Jun.	168	Jun.	1	Jun.	0	Jun.	0	June	0	June	0
July	0	Jul.	28	Jul.	0	Jul.	0	Jul.	0	July	0	July	0
Aug.	0	Aug.	34	Aug.	0	Aug.	0	Aug.	0	Aug.	0		
Sept.	0	Sept.	23	Sept.	0	Sept.	0	Sept.	0	Sept.	0		
Oct.	0	Oct.	19	Oct.	1	Oct.	0	Oct.	0	Oct.	0		
Nov.	0	Nov.	12	Nov.	0	Nov.	0	Nov.	0	Nov.	0		
Dec.	0	Dec.	4	Dec.	0	Dec.	0	Dec.	0	Dec.	2		
Total	0	Total	873	Total	11	Total	0	Total	5	Total	2		

THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII September, 1927 No. 3

IDENTIFICATION OF CITRUS INSECTS IN THE FIELD*

By JEFF CHAFFIN

Assistant Nursery Inspector
State Plant Board

There are volumes of publications, literature and illustrations describing and giving control measures for our various citrus insects. In the face of these facts inspectors of the State Plant Board are frequently called upon by growers, men doing public spraying, and even agricultural workers, to identify the most common citrus insects such as purple scale, Florida red scale, ladybeetles, parasites and friendly fungi. I am going to try to tell you briefly in our good old native tongue, leaving out all unnecessary entomological and scientific terms, how to recognize our common and more important citrus insects.

There is no necessity for discussing any subject unless it is of sufficient importance, so let us first briefly summarize the importance of citrus insects. Did you ever stop to think that there is not a staple crop grown that is not attacked by some insect? So far as I know, there is not an injurious insect that does not have a parasite or some natural enemy. Frequently, due to climatic conditions and other causes, the parasites and natural enemies are unable to keep an insect under control and it is necessary to assist by spraying, dusting or other methods of control. Such is the case with citrus insects. Some of them are held under perfect control by parasites while others are not and spraying becomes necessary. If you will go to the bottom of the proposition and consider it from all angles, you will find that in an unsprayed citrus grove twenty-five percent or more of the fertilizer and cultivation goes to the support of insects and the crop is greatly reduced, to say nothing of the vigor and vitality that are constantly sapped from the trees. When you figure that less than fifty percent of our groves are sprayed and fifty percent of the spraying is done in a haphazard fashion, you

Report of a talk delivered before the Citrus Section, Farmers' and Fruit Growers' Week, Gainesville, Fla., Aug., 1926.

will realize that the loss from citrus insects amounts to thousands and thousands of dollars annually in Florida. Were it not for the parasites and other natural enemies of citrus insects, they would destroy our industry in a few years.

Every grower and agricultural worker should learn to recognize the more common citrus pests as well as the beneficial ladybeetles, parasites and friendly fungi. This is absolutely necessary in order to know when to spray, and it is generally conceded that spraying at the right time with the proper materials is the best investment a citrus grower can make.

The animal kingdom is divided into Branches, Classes, Orders, Families, Genera and Species. This division and classification was in part started nearly two hundred years ago by the famous Swedish scientist, Linnaeus, and much of his work still stands. This classification and use of scientific names is absolutely necessary, for what is known as a "stink bug" in Alachua County may be called a "pumpkin bug" in Lee County and a "June bug" in Georgia. There must be some name for an insect that will hold good in all countries and in all languages. These scientific names are principally of Latin or Greek origin and have a descriptive meaning. For example, beetles all belong to the Order Coleoptera, which means "sheath wing." True bugs come under the order Hemiptera, which means "half wing."

An adult insect is a small animal having six legs. If it has more or less than six legs, it is not an insect. For example, red spiders and other spiders are not insects but belong to another class. All insects belong to the Class Insecta. The Class Insecta is divided into twenty-four large orders. All of the scale-insects belong to the Order Homoptera, which is one of these twenty-four. Each of these orders is further divided into families, the families into genera and the genera into species. Insects which are very similar in appearance, construction and habits are classed under one genus. Similar genera likewise are placed in one family.

Dating back beyond the Dark Ages, as far back as we have any record of man, there has been a war raging between two or more races of people and at times civil wars. The same condition exists among the lower forms of animal life. Go into a citrus grove and familiarize yourself with the common citrus insects and their parasites, study their habits, watch their adapta-

tion and development. Your interest will be claimed for hours at a time, if you have the slightest trace of scientific or entomological curiosity. There among those insects you will find war without end. No prisoners are taken or exchanged.

Now let us note what you will find when you go into that citrus grove. You will find three kinds of injurious insects: viz., sucking insects, chewing insects and scarifying insects. The scarifying insects include the purple mite, six-spotted mite, rust mite and thrips. Any one of these pests may become numerous enough to require spraying or dusting.

The Purple Mite is purplish red in color and large enough to be visible to the unaided eye. It does most of its work on the upper surface of the leaf or foliage. It gives the foliage a dusty, ashy appearance and upon close examination of a leaf hundreds of small white scars or marks will be found. These mites are usually found running over the surface of the leaf.

The Six-Spotted Mite is much smaller than the Purple Mite and light yellow in color. It is almost invisible to the unaided eye and it is difficult to find the six small black spots even with a good hand lens. This mite does its damage on the under side of the leaf along the midrib and veins. Viewing the foliage from the upper surface, the injury shows through the leaf as yellowish or brown spots or a streak along the midrib of the leaf. The minute mites will be found on the under side, generally working under a fine silken web.

The Rust Mite may be recognized with a good hand lens. They appear as small white round or wedge-shaped specks. They may be found on both fruit and foliage.

Thrips do most of their damage while the tree is in bloom. If you will jar a bunch of orange blossoms against the palm of your hand, you will generally catch several thrips. These small insects feed on the pollen and occasionally take a bite out of the young fruit. An injury so small as to be invisible to the unaided eye on fruit while in blossom will make a scar as large as the end of the finger when the fruit has attained full size. Lime-sulphur solution or sulphur dust will control all citrus scarifying pests except thrips. The latter may be controlled by the addition of nicotine sulphate to the lime-sulphur.

Chewing insects include grasshoppers, caterpillars, beetles and white ants. It is very seldom that the chewing insects do enough damage in a citrus grove to justify spraying. The

white ants, or termites, however, will often kill newly set trees by eating the bark and girdling them just beneath the surface of the soil. This is especially true where trees are planted on new ground from which timber has been recently cleared away. The Orange Dog (caterpillar of a large butterfly) occasionally becomes numerous enough to defoliate young trees.

Sucking insects are more important and do much more damage than both the chewing and scarifying insects together. Of the sucking insects there are five distinct groups: viz., scale-insects, whiteflies, mealybugs, aphids and plant-bugs. These may be further divided.

Of the plant-bugs there are four that are injurious to citrus fruits: The Southern Green Stink-Bug, the Cotton Stainer, the Big-Thighed Plant-Bug and the Leaf-Footed Plant-Bug. The Southern Green Stink-Bug is the most injurious and causes thousands of boxes of fruit to drop in Florida each year. The Cotton Stainer is probably next in importance. These plant-bugs attack the fruit about the time it has reached maturity. An orange will drop within a few days after being punctured by one of these insects. If these bugs are very numerous they may be observed in clusters on the fruit and limbs. Harvesting the beggarweed and other cover crops upon which the eggs of these insects are deposited, before the bugs mature wings, is recommended as the best means of control.

Among the plant lice we have the so-called New Citrus Aphid, with which Florida growers first became familiar in 1924-1925. These plant lice feed upon the tender growth and their presence is generally first noticed by the wrinkling and curling of the young, tender leaves. Upon uncurling one of these leaves the aphids will generally be found in several stages of development. The winged adult is black and green in color. The black appearance of the leaves is due to sooty mold growing on the honeydew excreted by the aphids.

Mealybugs are noticeable by the white cottony coverings of the egg masses and other white powdery material. They generally become numerous during dry weather. There is a friendly fungus that keeps them under control during the period of summer rains. They first appear in crotches of limbs, around the stems and between the fruit where it hangs in clusters. The Cottony-Cushion Scale is the only insect which is

likely to be confused with the mealybugs. This insect is much larger than mealybugs and its white egg sac is ridged or fluted. Mealybugs are much smaller and the white egg sacs are not fluted but generally irregular in shape.

There are thirty or more species of whiteflies in Florida which attack various and sundry plants. Of this number, only about four attack citrus and only two of these, the Common Whitefly and Cloudy-Winged Whitefly, do any serious damage. A great many citrus growers identify the presence of the whitefly by the black leaves or sooty mold on the trees. They refer to the sooty mold as the whitefly and have not been interested enough or taken the trouble to turn over a leaf and see if there were dozens of whitefly larvae on the under side. This sooty mold identification will not hold good, as practically all of the soft, or unarmored scales, mealybugs and aphids excrete honeydew and the mold will grow on honeydew regardless of its origin. This kind of identification was impressed upon me in several instances last spring, when owners of aphid-infested groves insisted that whitefly was also present, because the leaves were black. The Woolly Whitefly does not amount to much because it is very highly parasitized. It injures the tree's appearance, however, and will alarm a grower quicker than almost anything else, if he is not familiar with it. The larvae of this whitefly are covered with little cocoon-like masses consisting of fine white waxen threads. These are about the size of number eight bird shot, situated on the under side of the leaf. At certain periods during the year, in whitefly infested groves, will be found millions of little whitefly adults. These adults do but little damage. It is the larvae that emerge from the millions of eggs which the adults deposit on the tender leaves that sap the life from the trees. The sooty mold that grows on the honeydew excreted by the larvae, and which covers the foliage, keeps out the light and thereby also does a large amount of damage.

Last but not least are the scale-insects. There are about nineteen of these that attack citrus. Of this number, about five may be regarded as major pests. Any one or all of the others would probably prove very destructive were it not for the fact that they are more effectively held in check by parasites and friendly fungi. The Soft Brown Scale, Hemispherical Scale and Florida Wax Scale occasionally become numerous and destructive, especially in young groves where the parasites and other

natural controls have not had a chance to become established. The Soft Brown Scale, or Turtle-Back Scale, as it is sometimes called, is shaped like a turtle and is found in clusters or colonies, covering both twigs and leaves. The Hemispherical Scale is similar to the Soft Brown Scale, but higher and more rounded. The Florida Wax Scale is smaller in circumference and higher and white in color. A large amount of honeydew and sooty mold always accompanies these three insects. The numerous ants generally present feed on the honeydew and usually aid in distributing the small crawlers or young scales. The ants do not destroy the scale insects, as is occasionally supposed. They have been known, however, to destroy the larvae of ladybeetles which prey on the scale-insects.

The Cottony-Cushion Scale may be placed in the group of insects just mentioned. However, it is much more destructive and will quickly ruin a grove unless brought under control. This scale, on account of its large waxy or cottony egg mass, does not respond to spraying very readily. The Australian Ladybeetle (Vedalia), however, is a natural control and will practically eliminate this scale from a grove in a comparatively short time. This small ladybeetle is reared and kept in cold storage by the Entomological Department of the State Plant Board. A colony of the beetles may be secured at almost any time. This scale is easily identified, as it is a large insect. The egg sac is sometimes as large as a finger nail, white in color and ridged or fluted.

The Chaff Scale is a small brown or grayish, odd shaped insect, very nearly the color of the bark of a citrus tree. If you will look on the trunk of any tree in an old grove you will find this scale. It has a longer beak than most scale-insects and can live on thicker bark. It does not confine its work to the trunks of trees, however, but sometimes becomes very numerous on twigs, leaves and fruit, especially if the grove has been sprayed with Bordeaux mixture and the friendly fungi killed.

The Florida Red Scale is one of the most troublesome citrus insects that we have to deal with and if given half a chance it will ruin a grove in a short while. This insect is circular in shape, dark red or brown in color, and a little larger than the head of a pin. It confines its work to the leaves and fruit and occasionally very tender twigs. Quite recently I saw a nine

year old grove almost completely defoliated by this insect. A good, strong insecticide is required to kill it and generally two or more sprayings are necessary.

The Purple Scale I believe causes more damage to the citrus industry in Florida than any other insect. It is true that the rust mite may ruin a fruit crop and whiteflies may play havoc with a grove for a few years, but the old purple scale is continually sapping the life from every grove in the state. As previously stated, over fifty percent of our spraying is done in a haphazard manner but even with that, a sprayed grove always produces more fruit than a similar grove that is not sprayed. If you will crawl under a tree and look up you will see the reason. You will see hundreds of small limbs or branches in the unsprayed grove that have been killed by this scale. So much of the wood inside the tree has been killed that only a shell of foliage on the outside remains. The tree looks all right from a distance or from the outside, but when the fruit is picked none is found on the inside. The purple scale is a little brown insect, rounded at one end and tapering to a point at the other. The male scales are often purplish, hence its name. It is the most common scale-insect we find on citrus and is found in every grove and nursery in the state.

The Long Scale is similar to the purple scale, but is longer and narrower. For all practical purposes it may be classed with the purple scale.

The descriptions of scale-insects that I have given you are descriptions of the scale or covering. The insect itself lives under the scale. When a young scale-insect first hatches and begins moving around it has six legs like any other insect, but is so small as to be practically invisible to the unaided eye. This little scale crawler, after finding a suitable location on a twig or leaf, at once inserts its beak and begins extracting juices from the tree. It generally remains there during the balance of its life, and some species lose their legs as they have no further use for them. As the insect grows it excretes a waxy substance which hardens and forms a scale or covering over the body for protection. This scale, insect and all, is what is generally referred to as a scale-insect. The eggs are deposited and the young hatch under the scale or shell of the female. The male scale-insect emerges as a winged adult, lives only a few

days and dies. If you will shake a limb which is severely infested with scale-insects you will frequently be able to see a large number of small, delicate, winged, gnat-like creatures, but smaller than gnats. These are the male scale-insects.

Among these numerous injurious insects that you can find in a grove you will see a large number of beneficial insects that are preying on the injurious ones. Among the beneficial ones might be mentioned the soldier bugs, which resemble plant-bugs but are much narrower. One species, the Wheel-Bug, has a wheel-shaped back. Then there are the minute, wasp-like parasites, the trash bugs or aphis lions, syrphus flies, little brick-red caterpillars that eat mealybugs and cottony-cushion scale and other scale-insects. There are also about seven or eight different kinds of ladybeetles. Species with two spots, some red or orange, and some with black spots, are the most numerous.

You will also find at least five beneficial scale-fungi and five whitefly-fungi. You will find the scale-insects and the limbs of the trees covered with small red-headed pegs. This is the Red-Headed Scale-Fungus. You will notice some that appear a faded out red or pink in color. That is the Pink Scale-Fungus. Others appear to be dead and faded out to a light, dirty gray color. That is the White-Headed Scale-Fungus. You will notice on the larger limbs that the scale-insects have died and are covered with little patches of black growth. That is the Black Scale-Fungus. The Turbinate Scale-Fungus attacks the Florida wax scale and is much larger than other scale-fungi.

On the under side of the leaves, attacking the whitefly larvae, you will find red, yellow, brown, white-fringed and cinnamon-colored fungi.

There is a man down in my territory who has owned a fine old seedling grove for thirty years. He had never sprayed; in fact, he was "agin" spraying and would point out the fact that several of his neighbors sprayed and still he produced more fruit than any of them. He had not stopped to reason out the fact that he had a better grove than any of his neighbors and that if he sprayed he would produce still more fruit and brighter fruit. Last fall I had occasion to visit him on another mission. It was hot and we stopped under the shade of a large old seedling grapefruit tree to talk. The trees were badly infested with scale-insects and we found every imaginable scale parasite: Trash bugs with dead scale-insects hanging on their backs, four

or five different kinds of ladybeetles, two or three soldier-bugs, scale-fungi of all kinds and practically every other beneficial parasite or fungus. We watched the work of the insects and I "lined them up" for him, pointed out his soldiers (friendly insects and friendly fungi) and showed him what a big fight he had going on in that tree. He became very much interested and it seemed to confirm his idea that he should not spray. I then showed him how spraying with an oil emulsion would form a film of oil around the scale-insects and smother them to death without seriously injuring the friendly insects, and that with the assistance of this kind of spraying his soldiers would have no trouble in winning the fight that had been going on for thirty years or more. I did not insist or even suggest that he get busy and begin spraying. I just showed him the plain facts and made an identification of insects for him. About a month later I was in that town again and met this grower. He insisted on my going out and taking dinner with him. He said he had something he wanted to show me, and that he had decided to help out his soldiers a little. As a matter of fact, he had a new power sprayer and at present has one of the cleanest groves and largest crops of bright fruit in the county. The point I am trying to make is this: Do not tell a man he should spray and then stop. Take him out into his grove and show him what he has and when he thoroughly understands the matter and sees what the insects are doing, you can't keep him from spraying.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

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NEW PLANT BOARD RULES EFFECTIVE JANUARY 1, 1928

The State Plant Board, at its meeting held at Tallahassee on September 12, 1927, and following a public hearing on the subject, passed rules and regulations governing the movement into and within the state of plants and plant products. At the same time similar rules and regulations were adopted with respect to the apiary inspection service. Action was based on the new Plant Act of 1927 (Chapter 12291) and the new Apiary Inspection Law (Chapter 12050).

As was anticipated, no radical or revolutionary changes were made in the rules and regulations. Considerable modification in a number of instances was effected. The wording of some rules was simplified and the meaning clarified. Perhaps the most marked changes were made in connection with the rules applying to the inspection of nursery stock. An outstanding change from former practice was the decision to make use of an annual certificate tag rather than of tags which were without date of expiration. Under the new rules such certificate

tags will be valid from date of issuance to June 30 next following. Another change of interest to nurserymen was the decision to require, as a preliminary to movement, defoliation of citrus nursery stock only. Heretofore the rule on this specified that all nursery stock, with certain exceptions, must be defoliated.

Under the action of the Board, the new rules become effective January 1, 1928. In the meantime the rules adopted under the Plant Act of 1915 and the Bee Disease Law of 1919 continue in effect. This will afford ample opportunity for all interested parties to become familiar with the rules as adopted and to adjust themselves to any changes in practice which may become necessary. The new rules will be published in full in the October issue of The Monthly Bulletin and the Nursery Inspector will in due time supply essential information for the guidance of nursery operators and stock dealers.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEPARTMENT REPORTS

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S MONTHLY SUMMARY

AUGUST, 1927

SHIPS AND VESSELS INSPECTED:

From Foreign Ports—			
Direct	189		
Via U. S. Ports	60		
Total		249	
From U. S. Ports other than Florida		161	
From Florida Ports		45	
Total			455

NUMBER OF PARCELS INSPECTED:

Arriving by water:		
Passed	17,240	
Treated and passed	68,226	
Returned to shipper	374	
Contraband destroyed	114	
Total		85,954
Arriving by land—express, freight, wagon, etc.:		
Passed	1,366	
Treated and passed	1	
Returned to shipper	0	
Contraband destroyed	0	
Total		1,367
Arriving by mail:		
Passed	47	
Treated and passed	3	
Returned to shipper	3	
Contraband destroyed	1	
Total		54
GRAND TOTAL OF PARCELS INSPECTED		87,375
Number of parcels on hand pending determination as to final disposition		0

BEE DISEASE ERADICATION

REPORT FOR MONTH OF AUGUST, 1927

Number of apiaries inspected	128
Number of colonies inspected	2,735
Number of apiaries infected with American foul brood	0
Number of colonies infected with American foul brood	0
Number of apiaries infected with European foul brood	0
Number of colonies infected with European foul brood	0

NURSERY INSPECTION DEPARTMENT

Nursery Inspector's Summary for Month Ending August 31, 1927

Number nurseries inspected		905
Quantity of stock inspected		
Citrus	8,456,784	
Non-Citrus	11,527,865	
Total		19,984,649

DEPARTMENT OF CITRUS CANKER ERADICATION

Report on Eradication Work in Cooperation with the Bureau of Plant Industry, United States Department of Agriculture, for Month Ending August 31, 1927

Citrus grove trees inspected	1,258,425
Citrus nursery trees inspected	148,488
Inspectors employed on citrus canker eradication	32
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

General Summary

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15,158
Nursery trees found infected since May, 1914	342,260
Number properties found infected to August 31, 1927	513
Properties declared no longer danger centers	512
Properties still classed as actively infected August 31, 1927	1

Department of Citrus Canker Eradication (Report Continued)

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to August 31, 1927:

1914		1915		1916		1917		1918		1919		1920	
Jan.		Jan.	306	Jan.	86	Jan.	14	Jan.	0	Jan.	0	Jan.	0
Feb.		Feb.	165	Feb.	21	Feb.	4	Feb.	1	Feb.	0	Feb.	0
Mar.		Mar.	444	Mar.	49	Mar.	9	Mar.	1	Mar.	1	Mar.	0
Apr.		Apr.	408	Apr.	49	Apr.	169	Apr.	2	Apr.	1	Apr.	0
May	108	May	1042	May	338	May	52	May	1	May	1	May	0
Jun.	160	Jun.	772	Jun.	450	Jun.	45	Jun.	10	Jun.	0	Jun.	0
Jul.	275	Jul.	651	Jul.	349	Jul.	39	Jul.	0	Jul.	0	Jul.	539
Aug.	1313	Aug.	1345	Aug.	219	Aug.	30	Aug.	0	Aug.	1	Aug.	1
Sept.	767	Sept.	618	Sept.	124	Sept.	6	Sept.	0	Sept.	0	Sept.	0
Oct.	565	Oct.	214	Oct.	451	Oct.	2	Oct.	0	Oct.	0	Oct.	0
Nov.	773	Nov.	494	Nov.	131	Nov.	1	Nov.	0	Nov.	0	Nov.	0
Dec.	366	Dec.	256	Dec.	27	Dec.	1	Dec.	0	Dec.	0	Dec.	0
Total	4327	Total	6715	Total	2294	Total	372	Total	15	Total	4	Total	540

1921		1922		1923		1924		1925		1926		1927	
Jan.	0	Jan.	0	Jan.	1	Jan.	0	Jan.	0	Jan.	0	Jan	0
Feb.	0	Feb.	0	Feb.	1	Feb.	0	Feb.	0	Feb.	0	Feb	0
Mar.	0	Mar.	0	Mar.	2	Mar.	0	Mar.	5	Mar.	0	Mar.	0
Apr.	0	Apr.	0	Apr.	3	Apr.	0	Apr.	0	Apr.	0	Apr	0
May	0	May	585	May	2	May	0	May	0	May	0	May	0
Jun.	0	Jun.	168	Jun.	1	Jun.	0	Jun.	0	June	0	June	0
July	0	Jul.	28	Jul.	0	Jul.	0	Jul.	0	July	0	July	0
Aug.	0	Aug.	34	Aug.	0	Aug.	0	Aug.	0	Aug.	0	Aug.	0
Sept.	0	Sept.	23	Sept.	0	Sept.	0	Sept.	0	Sept	0		
Oct.	0	Oct.	19	Oct.	1	Oct.	0	Oct.	0	Oct.	0		
Nov.	0	Nov.	12	Nov.	0	Nov.	0	Nov.	0	Nov.	0		
Dec.	0	Dec.	4	Dec.	0	Dec.	0	Dec.	0	Dec.	2		
Total	0	Total	878	Total	11	Total	0	Total	5	Total	2		

THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII October, 1927 No. 4

RULES AND REGULATIONS MADE BY THE STATE PLANT BOARD PURSUANT TO THE FLORIDA PLANT ACT OF 1927*

The following rules and regulations were adopted by the State Plant Board at its regular meeting held at Tallahassee September 12, 1927. These rules and regulations are effective January 1, 1928.

Rule 1. The sale, gift or exchange or the shipment or movement into or within the State of Florida of trees, plants or plant products infested or infected with any especially injurious plant pest is prohibited. This rule shall not apply to the movement of plant products that are intended as food products unless in the opinion of the State Plant Board such shipment will be dangerous to the agricultural and horticultural interests of the State.

Rule 2. The sale, exposure or offering for sale, gift, exchange, shipment or movement of trees, plants or plant products brought into the State of Florida in violation of the Plant Act of 1927 or of any of the rules and regulations of the State Plant Board passed in accordance with that Act is hereby prohibited.

Rule 3. Every grove, field, nursery or other property in which has been found any especially injurious disease or insect pest may be conspicuously posted when deemed necessary with signs warning all parties against trespassing, said signs to read as follows: "No Trespassing. By order of the State Plant Board." The words "NO TRESPASSING" shall be in letters no less than four inches in height and the words "State Plant Board" be in letters not less than two and one-half inches in height, such letters to be of prominent bold-faced type, easily read. The mutilation, defacing, removing or destroying of such signs by any parties whomsoever is hereby prohibited, provided that the posting of such notices shall not be required in the case

*In accordance with subsection 15 of Section 5 of the Plant Act of 1927 all regulations, rules, public notices and other official acts of the State Plant Board which should be given publicity may be published in an official organ of the Board which the Board is authorized to issue at regular intervals to be determined by the Board. The Board has authorized the publication of a Monthly Bulletin in which hereafter all rules, regulations, etc., will appear. All rules and regulations passed by the Board have the full force and effect of law.

of any property which has been declared by the State Plant Board to be no longer a danger center.

Rule 4. Any person affected by any rule or regulation made or notice given pursuant to the Florida Plant Act of 1927 may have a review thereof, for the purpose of having such rule, regulation or notice modified, suspended or withdrawn, by filing a written request with the Chairman of the State Plant Board, stating the particular rule, regulation or notice regarding which action is desired and setting forth the objections to the enforcement of said rule, regulation or notice.

If a special meeting of the Board is desired to consider such review, or if the destruction of property is involved, the person asking for same shall, at the time of filing said written request, deposit a certified check for one hundred and fifty dollars ($150) with the Chairman of the Board or the agent of the Board responsible for the carrying out of the provisions of the Florida Plant Act of 1927 in the locality in which the property affected is located. Said sum of $150 is to be applied towards defraying the expenses of the special meeting of the Board, provided the Chairman considers the exigencies of the case require action before the next regular meeting.

In case such special meeting is called the Secretary of the Board shall present an account of the expenses incurred for holding said meeting and if these expenses are less than $150 the balance shall be returned to the person requesting the review.

On such review all facts and representations offered on behalf of the applicant or on behalf of the Board may be presented to the Board in the form of affidavits.

The operation or enforcement of any rule or regulation made or notice given by the Board is not to be held in abeyance pending a review thereof but is to remain in full force and effect until modified, suspended or withdrawn by action of the Board: provided that where the enforcement of a rule requires the destruction of the property of the party making the appeal to the Board in the manner aforesaid and the said sum of $150 to cover costs having been deposited with an agent of the Board, such destruction shall be suspended until the party shall have had the opportunity of being heard on his appeal; provided, further, that when an appeal is filed instructions shall be issued by a duly authorized agent of the Board to the owner of the

property involved, or his agent, specifying the means to be made use of and the precautions to be taken to prevent the dissemination of plant diseases or insect pests and such instructions must be complied with.

Rule 5A. All plants found to be infected with citrus canker (*Pseudomonas citri* Hasse) shall be entirely destroyed by burning, and, when possible, without being cut, or otherwise handled or moved. Further, the ground shall be thoroughly burned for a distance of three feet beyond the utmost spread of the branches of the infected plant; provided, however, that the Plant Pathologist, acting under the direction of the Plant Commissioner, may carry on such experiments with infected trees as the Plant Board may deem advisable, as looking toward the control and cure of citrus canker. Said experiments shall be conducted under such conditions as will not endanger healthy trees by the spread of citrus canker.

Rule 5B. The planting, transplanting or otherwise moving of any plants which are infected with citrus canker or which, in the opinion of the Board, have been exposed to citrus canker and thus are likely to carry canker infections, is prohibited.

Rule 5C. Every grove, nursery or separate plant situated in the State of Florida which has been found to be infected with citrus canker is hereby declared to be the center of an infected and dangerous zone.

Rule 5D. The planting or movement of citrus plants within a zone extending one-half mile in every direction from said center is hereby prohibited until such time as in the judgment of the Board such dangerous conditions may have ceased to exist; provided, that citrus trees or plants in such zone may be moved within a property located more than one-quarter of a mile from the center of such zone, when moved under the supervision of an agent of the Plant Board, and provided, further, that citrus trees from certified nurseries may be planted as re-sets in non-infected groves located within such zone when such replanting is done under the supervision of an agent of the Plant Board, and provided, further, that citrus trees or plants located within such zone may be budded by and with the consent and approval of the Plant Board under such precautions and conditions as it may specify.

Rule 5E. No certificate shall be issued for the movement of citrus nursery stock located within one mile of any center of in-

fection as defined above until such time as in the judgment of the Board the dangerous conditions in such center may have ceased to exist.

Rule 5F. The movement of non-citrus trees and plants from within any canker-infected grove or nursery is prohibited until such time as in the judgment of the Board the dangerous conditions in such property may have ceased to exist.

Rule 5G. The movement of citrus trees or plants or the planting of citrus trees, plants or seeds within any canker-infected property or center as defined in the rules of the Board is hereby prohibited until the Board shall have declared such property to be no longer a dangerous center, and thereafter until the soil in such infected property shall have been disinfected in such manner, to such an extent and under such conditions as the Board may prescribe.

Rule 5H. No certificate shall be issued for the movement of nursery stock from a nursery in which vehicles, teams, laborers or other persons, nursery implements or other things enter, that likewise enter or are used in any nursery or grove infected with citrus canker.

Rule 5I. The planting, cultivating or harvesting of any crop in a grove or nursery which is, has been, or shall become infected with citrus canker, is hereby prohibited until such time as the Plant Board may deem such procedure unlikely to spread citrus canker.

Rule 5J. Work in properties infected with citrus canker shall be carried on by the owner or his employees under the general supervision of agents of the Plant Board appointed especially for this purpose. Said agents shall prescribe such precautions in connection with the grove operations as will tend to prevent the spread or dissemination of citrus canker.

Rule 5K. The harvesting of citrus fruits from any grove which is, has been or shall become infected with citrus canker is hereby prohibited except when such harvesting shall be carried on under the immediate supervision of an agent of the Plant Board whose wages shall be paid by the owner of the fruit at the time it is picked. The harvesting of such fruit and the hauling or otherwise moving thereof shall be such as to render unlikely the further dissemination of citrus canker.

The packing of citrus fruit from such an infected property shall be carried on only under the immediate supervision of an

agent of the Board whose wages shall be paid by the person operating the packing house at which the fruit is prepared for shipment, or in case such fruit is not prepared for shipment in a packing house, by the person owning the fruit at the time it is packed. The packing and other handling of such fruit for shipment shall be such as to render unlikely the further dissemination of citrus canker.

The shipment of citrus fruit consigned to any point in the State of Florida from such an infected grove or from any packing house in which the fruit from such an infected grove has been prepared for shipment, is hereby prohibited.

The shipment of citrus fruit in bulk or otherwise than wrapped and packed in standard crates from such infected property or from any packing house in which fruit from an infected property is prepared for shipment, is hereby prohibited, and the acceptance thereof for transportation by a common carrier is likewise prohibited.

This rule shall not apply to such properties as have been declared by the Board as no longer infected with citrus canker.

Rule 5L. The pasturing, or allowing to run at large, of live stock, poultry and hogs included, in any grove or other property which is, has been, or shall become infected with citrus canker, is hereby prohibited until such time as the Board may deem such procedure unlikely to spread citrus canker.

Rule 6A. Inspectors employed by the State Plant Board shall examine plants and plant products in nurseries, orchards and other premises in the State of Florida, in order to determine whether such plants or plant products are infested by the spiny citrus whitefly *(Aleurocanthus woglumi* Ashby), and shall report their findings to the Plant Commissioner.

Rule 6B. Every grove, nursery or separate plant situated in the State of Florida which has been found to be infested with the spiny citrus whitefly is hereby declared to be the center of an infected and dangerous zone.

Rule 6C. All trees or plants found to be infested by the spiny citrus whitefly shall be treated by, or under the personal supervision of, an agent of the Plant Board, by completely burning with a burning oil spray, all leaves, twigs, and tender growth thereon and by thoroughly searing or flaming all portions of the limbs, branches and trunks thereof, without such infested trees or plants being cut or otherwise handled or moved; and

immediately after such treatment said trees or plants shall be sprayed with a suitable contact insecticide: provided, that this rule shall not be construed as preventing a duly authorized agent of the Board from taking from such infested trees or plants, under suitable precautions, specimens of infested parts for record.

All possible or probable host plants of the spiny citrus whitefly and all plants which might serve as carriers of the spiny citrus whitefly near or adjacent to any tree or plant found infested by said insect shall be completely defoliated, the foliage burned and the trees or plants sprayed with a suitable contact insecticide and all materials and things adjacent to such infestation which materials or things might act as carriers of the spiny citrus whitefly shall be so treated by fumigation, spraying or otherwise as to render least likely the carriage of infestation; the area within which such trees, plants, materials or things shall be so treated to be prescribed by the Plant Board upon the report of its assistants or inspectors as to the extent or severity of the infestation. Beyond the zone in which infested or exposed trees, plants, materials or things are treated as aforesaid, and to such distance as the Plant Board may deem necessary, all host plants and possible host plants or carriers of the spiny citrus whitefly shall be sprayed with a contact insecticide of such character and at such intervals as may be necessary to prevent further infestation.

Rule 6D. The planting, transplanting or otherwise moving of any plants which are infested by the spiny citrus whitefly or which are likely to carry or transmit infestation by said insect, is prohibited.

Rule 6E. The planting or movement of trees and plants of all kinds and descriptions and the movement of all parts of plants, other than manufactured articles, within or from a zone extending one-half mile in every direction from a center of infestation, except by special permit of the Plant Commissioner, is hereby prohibited until such time as in the judgment of the Board the dangerous conditions caused by the presence of the spiny citrus whitefly may have ceased to exist.

Rule 6F. No certificate shall be issued for the movement of any nursery stock located within one mile of any center of infestation as defined until such time as in the judgment of the Board such dangerous condition in said center may have ceased

to exist, or from a nursery in which vehicles, teams, laborers or other persons, nursery implements or other things enter, that likewise enter or are used in any nursery, grove or premises infested with the spiny citrus whitefly.

Rule 6G. All work, including the harvesting of fruits, vegetables and other crops, in properties infested with the spiny citrus whitefly, and in properties which by their proximity to infested properties are likely to be infested, shall be carried on under the supervision of agents of the State Plant Board and under such precautions as the Plant Board shall specify.

Rule 7A. Under the provisions of the Florida Plant Act of 1927, the State Plant Board finds that the sweet potato weevil *(Cylas formicarius* (Fab.)) is an insect pest the dissemination of which should be prevented, that sweet potato plants, vines, slips, cuttings, draws and tubers and morning-glory *(Ipomoea* sp.) and moonflower *(Calonyction* spp.) vines and roots are plants likely to become infested by said insect pest, and that the following areas are areas within the State of Florida in which said insect pest is known to occur:

The Counties of Baker, Brevard, Broward, Collier, Dade, Duval, Flagler, Hendry, Lake, Lee, Manatee, Monroe, Nassau, Okeechobee, Orange, Palm Beach, Pinellas, Saint Johns, Saint Lucie, Sarasota, all that portion of Hillsborough County lying west of the Range line between Range 21 East and Range 22 East; all that portion of Charlotte County lying within and west of the Range line between Range 24 East and Range 25 East; all that portion of DeSoto County lying within Township 36 South, Range 23 East, Township 36 South, Range 24 East, Township 39 South, Range 23 East, and Township 39 South, Range 24 East; all that portion of Hardee County lying within Township 35 South, Range 23 East, Township 36 South, Range 23 East, and Township 36 South, Range 24 East; all that portion of Volusia County lying within a distance of fifteen miles of the coast line of the Atlantic Ocean.

Rule 7B. The movement or shipment of sweet potato slips, draws, vines, plants, and cuttings and of morning-glory tubers, roots, vines and parts thereof, from the areas designated by the State Plant Board as areas in which the sweet potato weevil *(Cylas formicarius* (Fab.)) occurs or which are infested by said weevil, into or through all parts of the State of Florida other than those specified as infested areas, is hereby prohibited, ex-

cept when such plants or parts of plants are accompanied by the inspection certificate of the State Plant Board.

Rule 7C. The movement or shipment of sweet potato tubers from the areas designated by the State Plant Board as areas in which the sweet potato weevil *(Cylas formicarius* (Fab.)) occurs or which are infested by said weevil, into all parts of the State of Florida other than those specified as infested areas, unless first fumigated under the personal supervision of an agent of the Plant Board and certified by him, is hereby prohibited: provided, that this rule shall not be construed as preventing the shipment of sweet potato tubers from infested sections in the State of Florida to points in other states when such tubers are securely sacked and shipped in tightly closed cars in carload shipments and provided, further, that this rule shall not be construed as preventing the shipment of canned sweet potatoes.

Rule 8. Every nurseryman in this state who propagates for sale, gift, barter or exchange any nursery stock consisting of palms and woody perennials, including budwood, cuttings and scions thereof, must have the nursery inspected by an authorized inspector of the State Plant Board to ascertain its condition with respect to plant pests and shall comply with the following regulations:*

Sec. A. Before transporting or delivering for transportation any nursery stock, which upon inspection has been found to be in satisfactory condition for certification, the nurseryman shall make application to the Nursery Inspector for certificate tags authorizing the movement of the stock. Such application must be made upon a blank form furnished by the Nursery Inspector. This application form shall contain a form of contract to be signed by the nurseryman agreeing to comply with all rules and regulations of the State Plant Board governing the movement of nursery stock. The application shall be accompanied by a remittance sufficient to defray the cost of the tags.

Sec. B. Every separate package, bundle, box or container of nursery stock requiring certification must have attached conspicuously to the outside, when moved, a nursery certificate tag.

Sec. C. All citrus nursery stock shall be completely defoliated, including leaf-stalks and in such manner that none of the leaves or clippings shall become mixed with any packing

*Florida forest grown trees and shrubs, when apparently free of plant pests may be transported without inspection and certification by a representative of the Plant Board.

material, immediately before removal or delivery for removal from the property on which grown, except as hereinafter provided. The carriage, shipment or delivery for carriage or shipment of undefoliated citrus nursery stock is prohibited: provided (1) that citrus trees in foliage may be moved to points outside the State of Florida; (2) that limited numbers of undefoliated citrus trees may be moved to fairs and exhibit rooms for display purposes if on an inspection by an inspector of the State Plant Board they are found to be apparently free from especially injurious plant pests; (3) that citrus seedlings less than 18 months old may be moved in an undefoliated condition from seedbeds for lining out in nursery rows when apparently free from especially injurious plant pests; and provided, further, that all undefoliated citrus, including seedlings, must be inspected immediately before movement by an inspector of the State Plant Board, and must be otherwise prepared and moved in accordance with the rules and regulations of the Board and must be accompanied by a special permit tag personally signed or authorized by the Nursery Inspector; all costs of such special inspection and the necessary supervision to be borne by the person or firm receiving the permit.

Sec. D. All nursery stock requiring certification and which is subject to attack by San Jose scale shall, immediately before being moved, be fumigated with hydrocyanic-acid gas at the rate of one ounce of ninety-eight per cent sodium cyanide, two ounces of sulphuric acid, specific gravity 1.83, and four ounces of water per hundred cubic feet, or be thoroughly scrubbed, using a solution of fish oil soap at a strength of one pound of soap to three gallons of water.

Sec. E. All citrus nursery stock, except citrus seedlings less than eighteen inches in height when removed from seed bed for lining out purposes, must be thoroughly scrubbed from the roots up in a solution of fish oil soap, immediately before being removed from the property where grown. The soap solution shall be at a strength of one pound of soap to three gallons of water. This scrubbing must be in such manner as to remove all scale-insects from the trees scrubbed.

Sec. F. Every nurseryman shall within one week after shipment mail or deliver to the Nursery Inspector an invoice covering every movement of nursery stock. Such invoices must show the date of movement, name and address of purchaser, name

and address of consignee if different from purchaser, the serial number of the certificate tag used and the number and kind of plants shipped.

Sec. G. When any nurseryman shall have repeatedly and persistently failed to promptly and accurately provide the Nursery Inspector with records of the movement by him of nursery stock as required, or in any other respect shall have failed to comply with any of the rules and regulations of the State Plant Board governing the movement of nursery stock, the unused nursery certificate tags issued to him may be recalled by the State Plant Board and placed in the hands of an Inspector of the Board. The Inspector in whose charge the certificate tags are placed shall issue same to the nurseryman as occasion requires when all rules and regulations of the State Plant Board are complied with by the nurseryman. The services of the Inspector shall be paid for by the owner of the nursery stock at the time the service is rendered: provided, that the State Plant Board may direct the Nursery Inspector to return any certificate tags recalled under this rule whenever the necessity for the retention of the certificate tags by the Nursery Inspector has ceased to exist.

Whenever nursery certificate tags are recalled by action of the Board, it shall be the duty of the holder of such tags to surrender same to the Nursery Inspector or other authorized agent of the Board. Upon failure to deliver such tags they shall become null and void and their further use is prohibited.

Sec. H. Every nurseryman shall at any time upon request of the Nursery Inspector give information as to the number of certificate tags he has on hand and the serial numbers of same and shall surrender promptly all unused tags in his possession upon the request of the Nursery Inspector. All mutilated tags must be returned promptly. The loss or destruction of tags must be reported promptly to the Nursery Inspector. All unused certificate tags must be returned when such become invalid from any cause. The alteration or re-use of a certificate tag is prohibited.

Sec. I. No nurseryman shall use a certificate tag upon stock other than that for which the tag was issued or permit its use by another: provided, that a nurseryman may use his tags upon stock obtained by him from a certified nursery of this state, or

upon stock brought into this state in compliance with the rules and regulations of the State Plant Board.

Sec. J. The owners, officers and employees of any nursery which may be found at any time to be infested or infected with any major plant pest, or which has heretofore been so infested or infected, shall, on demand of the State Plant Board, furnish a list of all movements of nursery stock from said nursery from any date set by the Board up to and including the date of such demand. Said list shall show the names and addresses of all purchasers, the names and addresses of all consignees and a complete description of the stock included in each and every shipment.

Sec. K. Persons or firms desiring inspection of nursery stock shall file a request for inspection with the Nursery Inspector at Gainesville, at least 60 days in advance of the date upon which they desire to move or sell such nursery stock. Persons or firms requesting inspection on shorter notice may be charged a fee sufficient to defray the expenses of inspection and certification.

Rule 9. The Nursery Inspector shall issue to nurserymen entitled to receive same certificates of inspection showing that the nursery described therein has been inspected and found to be in suitable condition to permit of the issuance of certificate tags.

Rule 10. The Nursery Inspector shall have printed and supply to each nurseryman upon request made upon a blank form prepared by the Nursery Inspector certificate tags authorizing the movement of his stock after the same has been inspected and found to be entitled to movement under the Plant Act of 1927 and the rules and regulations made pursuant thereto. An amount sufficient to defray the cost of these tags shall be deposited in advance with the Nursery Inspector. These tags shall be serially numbered and shall be valid until the 30th day of June subsequent to the date of issuance, unless revoked for cause. The wording of the certificate tag shall be substantially as that shown under Form 1, Rule 21.

These certificate tags shall be used in accordance with the rules and regulations of the State Plant Board and shall remain the property of the Board until used and accounted for.

Any nurseryman may have a copy of his nursery inspection certificate filed with the proper official of any other state or country upon request made to the Nursery Inspector.

Rule 11. Any certificate of inspection may be revoked or suspended and all certificate tags recalled at any time, for any violation of the provisions of the Florida Plant Act of 1927, of the rules and regulations of the State Plant Board, or of the quarantine regulations of the Federal Horticultural Board, or when any condition develops in the nursery which would have prevented in the first place the issuance of a certificate.

Rule 12. No certificate shall be issued for the movement of any nursery stock until such stock shall have been inspected by an agent of the State Plant Board, and found to be apparently free from major plant pests and to be in such condition with respect to other plant pests as to permit of movement.

Rule 13. No certificate shall be issued when the conditions of growth and cultivation of the nursery stock are such that an efficient inspection for plant pests cannot be made.

Rule 14. No certificate shall be issued for any nursery wherein the stock has been directly exposed through contact or otherwise to danger of infection or infestation by serious plant pests nor in the case of nurseries located within one-fourth mile of known infestation or infection of major plant pests: provided, however, that the nurseryman may remove such stock under the direction of the Nursery Inspector, and under such precautions as may be necessary to prevent danger of transmitting infection or infestation, and provided, further, that nothing in this rule shall be construed as preventing the enforcement of quarantines to a greater distance than one-fourth mile in the case of properties declared by the Board to be infested or infected with any major plant pest.

Rule 15. No certificate shall be issued to cover the citrus stock in any nursery in which scaly bark *(Cladosporium herbarum* var. *citricolum)* is present or has been found within a period of six months preceding, nor to cover the citrus stock in any nursery adjacent to a known scaly bark infection, nor to cover the citrus stock in any nursery in which tools, implements, other equipment and laborers are used which are likewise used in a scaly bark infected citrus property, unless such tools, implements, equipment and laborers have been properly disinfected

by the use of a disinfecting or germicidal solution prescribed by the Nursery Inspector.

Rule 16. Any person in this state engaged in the business of dealing in nursery stock which requires inspection and certification must make application to the Nursery Inspector for the issuance of certificate tags, said application to be made upon a blank form to be furnished by the Nursery Inspector. The applicant must supply the name under which the business will be conducted and the location. He must also give the names and addresses of all nurseries or others from whom he expects to obtain nursery stock and agree that he will buy no nursery stock for re-sale from any nursery until he has secured the permission of the Nursery Inspector therefor and that he will deal only in nursery stock that has been secured from a certified nursery in this state or has been brought into the state in accordance with the rules and regulations of the State Plant Board. The applicant must further agree to comply with the rules of the Board with reference to sending invoices for tags used. The application must be sworn to before an officer authorized to administer oaths.

Rule 17. When an application from a nursery stock dealer for certificate tags has been properly executed and filed with the Nursery Inspector, if the same be approved and is accompanied by an amount sufficient to defray the cost of the tags the Nursery Inspector will issue to the applicant dealer's certificate tags. These tags shall be serially numbered and shall be valid until the 30th day of June subsequent to the date of issuance unless revoked for cause. The wording of the certificate tag shall be substantially as that shown under Form 2, Rule 21.

Rule 18. Every dealer shall attach a certificate tag to each package, bundle, box or container of nursery stock disposed of and shall report each such transaction by an invoice sent to the Nursery Inspector within one week after shipment is made. Said invoice shall give the date of disposition, the name and address of the receiver, the number and kind of plants and the serial number of the tag used.

Rule 19. Dealer's certificate tags may be recalled at any time by the Nursery Inspector for failure to report sales or other movement of nursery stock by sending invoices or for

violation in other respects of the rules and regulations of the State Plant Board.

Rule 20. Any nurseryman, jobber, person, firm or organization doing business without the State of Florida who desires to ship into this state nursery stock consisting of palms, strawberry plants or woody perennials or parts thereof intended for propagation, from any state, territory or district of the United States shall comply with the following regulations:

Sec. A. Make application to the Nursery Inspector of the State Plant Board, on a blank form provided by the Nursery Inspector, for a permit to do so, filing with the application a statement of the location of the nursery or place of business owned or operated by him or them, and an official certificate of inspection of such stock or nurseries signed by the proper state official of the state where such stock or nursery is located. The application must be accompanied by an amount sufficient to defray the cost of the tags desired. The Nursery Inspector may then, if the application be approved, issue to the applicant serially-numbered permit certificate tags authorizing the shipment of the stock into the state, provided the same be admissible under the rules and regulations of the State Plant Board.

These tags shall be serially numbered and shall be valid until the 30th day of June subsequent to the date of issuance, unless revoked for cause. The wording of the certificate tag shall be substantially as that shown under Form 4, Rule 21.

Sec. B.

(1) One, and only one, Florida permit certificate tag shall be attached to each package, box, bundle or container of nursery stock shipped into Florida. In club orders, one permit tag should be attached to each individual order, and one permit tag attached to the package containing the individual orders.

(2) An invoice showing the name and address of consignor, name and address of consignee, kind and quantity of nursery stock in the shipment and the serial number of the permit tag attached to the shipment must be mailed to the Nursery Inspector, Gainesville, Florida, within one week after the shipment is made. An invoice is required for each individual order in a club order and also for the package containing the individual orders.

(3) All mutilated permit tags must be returned to the Nursery Inspector, Gainesville, Florida, for cancellation.

(4) All unused permit tags must be returned when same become invalid from any cause.

Sec. C. All host plants of San Jose scale shall, immediately before shipment into Florida, be fumigated with hydrocyanic-acid gas at the rate of one ounce of ninety-eight per cent sodium cyanide, two ounces of sulphuric acid, specific gravity 1.83, and four ounces of water per hundred cubic feet, or be thoroughly scrubbed, using a solution of fish oil soap at a strength of one pound of soap to three gallons of water.

Sec. D. ALL CITRUS TREES AND PARTS THEREOF ARE PROHIBITED ENTRY INTO THE STATE OF FLORIDA: provided that citrus nursery stock may be admitted when shipped from Washington, D. C., by the Bureau of Plant Industry, United States Department of Agriculture, and accompanied by an inspection certificate.

Rule 21. The forms of certificate tags to be issued to cover the movement of nursery stock shall be substantially as follows:

Form No. 1. (Serial Number)

Issued

(date)

STATE PLANT BOARD OF FLORIDA
Office of Nursery Inspector
Gainesville, Florida
NURSERY CERTIFICATE TAG

This is to certify that the nursery stock in the nursery of , located at - , Florida, has been inspected by an inspector of the State Plant Board of Florida in accordance with the Florida Plant Act of 1927 and the rules and regulations made pursuant thereto and is believed to be free from all major plant pests; and has been found to be in such condition with respect to other plant pests as to be entitled to movement under this certificate when such movement is otherwise made in conformity to law and the rules and regulations of the State Plant Board.

This certificate is valid until
unless revoked for cause. (date)

Approved:

Plant Commissioner. Nursery Inspector.

Form No. 2 (Serial Number)

Issued......................... . . .

(date)

STATE PLANT BOARD OF FLORIDA

Office of Nursery Inspector

Gainesville, Florida

NURSERY DEALER'S CERTIFICATE TAG

This is to certify that ....
of ...., Florida, has filed with the Nursery Inspector of the State Plant Board an affidavit giving the source of all nursery stock to be sold and agreeing to sell only nursery stock that has been inspected and is entitled to movement under this certificate when such movement is otherwise made in conformity to law and the rules and regulations of the State Plant Board.

This certificate is valid until.. . .....
unless revoked for cause. (date)

Approved:

Plant Commissioner. Nursery Inspector.

Form No. 3 (Serial Number)

FLORIDA STATE PLANT BOARD

Office of Nursery Inspector

Gainesville, Florida

PACKAGE CERTIFICATE TAG

...., Fla., ... 19 ...

This is to certify that the contents of this package from.......... ....
......................, of ...., Florida, addressed to.. ,
of ...., State of ...., have been carefully inspected and found to be apparently free from plant pests and may be sold and transported under the provisions of the Florida Plant Act of 1927.

A complete list of the plants transported under this tag is required to be given on the reverse side hereof and also to be forwarded to the Nursery Inspector, Gainesville, Florida.

The use of this certificate tag upon nursery stock which has not been inspected by an inspector of the Plant Board is a violation of the law and will be prosecuted.

....

Inspector. Nursery Inspector.

Form No. 4. (Serial Number)

.. . . , 19 .

FLORIDA STATE PLANT BOARD

Office of Nursery Inspector

Gainesville, Florida

PERMIT CERTIFICATE TAG

CITRUS WILL NOT BE ADMITTED UNDER THIS CERTIFICATE.

(This certificate permits shipments into Florida of non-citrus stock only.)

This is to certify that there has been filed with the Nursery Inspector of the State Plant Board of Florida the certificate of................................., stating that the stock grown in the nurseries of.................................., of ...., has been duly inspected for the season 19........-19........, and found to conform with the requirements of the State. Shipment of nursery stock from this nursery into the State of Florida is accordingly authorized when otherwise in conformity to law and the rules and regulations of the State Plant Board of Florida.

This certificate is valid until ....
unless revoked for cause. (date)

Approved:

Plant Commissioner. Nursery Inspector.

Form No. 5. (Serial Number)

FLORIDA STATE PLANT BOARD

Office of Quarantine Inspector

Gainesville, Florida

QUARANTINE DEPARTMENT CERTIFICATE TAG

...., Fla., ...19......

This is to certify that the undersigned has this day inspected the contents of this package from..., consigned to ...., State of ...., and has found them apparently free from especially injurious plant pests. No plants or plant products were found therein, the importation of which is prohibited by the rules of the State Plant Board of Florida under the Florida Plant Act of 1927.

All persons are warned, under penalty of the law, not to use this certificate tag upon any shipment, or upon any plants or plant products, other than those described and inspected as above.

Authorized:

Plant Commissioner. Quarantine Inspector.

....

Assistant Quarantine Inspector.

Rule 22. The introduction into the State of Florida through the ports thereof of plants, fruits, vegetables or other material likely to introduce plant pests especially injurious to the agricultural and horticultural interests of the State is prohibited: provided, however, that plants, parts of plants, fruits or vegetables, the importation of which into the State has not been specifically prohibited, and which shall be found upon inspection by a properly appointed agent of the State Plant Board to be apparently free from especially injurious plant pests shall be permitted to enter the State and be transported, sold, or exchanged within the State, when such transportation, sale or exchange is otherwise in conformity with law and the rules and regulations of the Board.

Rule 23. Any and all plants or plant products subject to the provisions of the Florida Plant Act of 1927, whether in transit or in the hands of the possessor, may be held for inspection regardless of whether they are certified or not, and if such plants or plant products are found to have been moved or transported in violation of the rules or regulations of the State Plant Board, or if found infested or infected with any injurious plant pest, such plants or plant products must be deported, fumigated, sprayed or otherwise treated upon the order of the Plant Board.

Rule 24. It shall be the duty of any common carrier, operating within the State of Florida, its agents or employees, to notify the State Plant Board, or its duly authorized agent, immediately upon the receipt by such common carrier of any shipment of any article or thing coming under the provisions of the Florida Plant Act of 1927 and offered to such common carrier for transportation and delivery, as to which the requirements of the Plant Act of 1927 or of any of the rules or regulations of the State Plant Board have not been complied with; and such common carrier shall not transport or deliver such illegal shipment but shall hold same safe pending instructions from the State Plant Board or its duly authorized representative as to the disposition to be made of such illegal shipment.

Rule 25. Any article or any box, bundle, parcel or other container which has been intercepted, while in transit, by an agent of the State Plant Board and is being held subject to examination or determination as to final disposition shall have attached to it a tag clearly indicating to employees of transportation companies and the public, that the article or container to

which the tag is attached is being held subject to the rules and regulations of the State Plant Board. The use of this tag or the removal of same from any article or container, to which it is attached, by any person other than an authorized agent of the Plant Board, is forbidden. This tag shall be known as the "Quarantine Tag," and shall be in substantially the following form:

UNDER QUARANTINE

HOLD OUT
For Inspection

Do not remove this package from this Station until this tag has been removed, and the contents of package inspected and certified by the Inspector of the

STATE PLANT BOARD
OF FLORIDA

(Over)

UNDER QUARANTINE

WARNING

This package and its contents are being held in quarantine. All persons are hereby warned not to open, destroy or remove the same under penalty of prosecution.
By order of

Plant Commissioner.

Assistant Quarantine Inspector.

STATE PLANT BOARD OF FLORIDA

(Over)

Rule 26. The movement or shipment of, or tampering with, any article or any box, bundle, parcel or other container having attached thereto a Quarantine Tag, which tag has been attached by an agent of the State Plant Board, is prohibited until such article or the contents of such box, bundle, parcel or other container shall have been inspected, the Quarantine Tag removed therefrom and the article or container officially released by an agent of the State Plant Board.

Rule 27. Whenever any authorized Inspector of the State Plant Board shall find in the possession of any common carrier in this State any shipment, article or product that is infected or infested with any plant pest, the dissemination of which, under the law or rules of this Board, now or hereafter promulgated, is or shall be prohibited, or that has been or is being

transported in violation of law or any of the rules of the Board, such common carrier shall make no further transportation or delivery of such shipment, article or product so infected or infested or illegally moved, otherwise than to return the same to the shipper, to be by him dealt with or treated as the law may provide or to remove to some point outside the State of Florida. At the time of such inspection such Inspector shall deliver to such common carrier a certificate in substantially the following form:

To...and All Whom It May Concern:
(Name of Carrier)

This is to certify that on the.....................day of.............................., 19.. .. ,
the undersigned inspected while in your possession at.. ,
Florida, a shipment of.., consisting of
(Kind and nature)
........................bundles, or packages shipped by..,
of ...., State of ....,
to ...., at ....,
State of Florida, and found the same to be infected or infested with
... . (or illegally transported.)
(Name of insect pest or disease)

And you are hereby notified that the transportation and delivery of said shipment so infected or infested (or illegally transported), within the State of Florida, is prohibited by law and the rules of the State Plant Board thereunder, except for the purpose of returning said shipment to the shipper, to be by him dealt with or treated as the law may require, or for removal from the State.

This..........................day of.., 19.........
...., Florida.

State Plant Board Inspector.

The said Inspector shall at the same time attach to such shipment a duplicate of said Certificate.

It shall also be the duty of said Inspector to forthwith notify the consignee and consignor, if their names and addresses be known to such Inspector, which notice shall contain in substance the information provided for in the foregoing form of certificate.

Rule 28. In order to prevent the introduction of the citrus disease known as citrus canker, the importation into Florida of any and all kinds of citrus trees and parts thereof, including budwood and scions, and all other host plants of this disease as soon as discovered, except certain fruit intended for use as food

products, is hereby prohibited: provided, that importation of limited quantities of new or rare varieties may be allowed by special permit of the State Plant Board. Application for such permits must be made to the State Plant Board, Gainesville, Florida.

Rule 29. The shipment, transportation or carrying of any and all citrus fruits, either by common carriers, dining or buffet cars, railway news companies, or individuals, into the State of Florida from the States of Georgia, Alabama, Mississippi, Louisiana or Texas, which states have had or now have considerable areas infected with citrus canker, is hereby prohibited. Shipments of citrus fruits arriving in Florida in violation of this rule shall be subject to confiscation and destruction.

Rule 30. The shipment, transportation or carrying of any and all citrus fruits, either by common carriers, dining or buffet cars, railway news companies, or individuals, into the State of Florida, from the State of California, is hereby prohibited on account of the prevalence in that state of the disease known as the Brown Rot of lemons and oranges *(Pythiacystis citrophthora)*. Shipments of citrus fruits arriving in violation of this rule shall be subject to confiscation and destruction.

Rule 31. DECLARING CERTAIN AREAS IN OTHER STATES TO BE INFESTED WITH THE JAPANESE BEETLE AND ESTABLISHING A QUARANTINE IN REFERENCE THERETO. Under the provisions of the Florida Plant Act of 1927, the State Plant Board of Florida finds that the Japanese beetle *(Popillia japonica* Newm.), an insect pest which does not occur in the State of Florida, now exists in the following states, to-wit: Connecticut, Delaware, New Jersey, New York and Pennsylvania.

And the State Plant Board of Florida further determines after due investigation that a quarantine is necessary in order to protect the agricultural and horticultural interests of this state.

The Board specifies the following plants, plant products and other things originating in the areas described now or hereafter by the Federal Horticultural Board as being infested with the Japanese beetle *(Popillia japonica* Newm.) as infested or likely to become infested with this insect pest, to-wit:

(1) *Farm products:* Farm, garden, and orchard products of all kinds, and grain and forage crops of all kinds.

(2) *Nursery and ornamental stock:* Nursery, ornamental, and greenhouse stock and all other plants and plant roots.

(3) *Sand, soil, earth, peat, compost and manure:* Sand, soil, earth, peat, compost, and manure of any kind and as to either bulk movement or in connection with farm products or nursery and ornamental stock.

It is therefore ordered by the State Plant Board of Florida that the introduction into the State of Florida of the plants and plant products and other articles above listed as infested or likely to become infested with this insect pest from the areas now designated by the Federal Horticultural Board in its regulations supplemental to its Notice of Quarantine No. 48 as infested areas, and from all other areas that may be hereafter found to be infested and so designated by the Federal Horticultural Board is hereby prohibited: provided that nursery stock and greenhouse stock and the other articles enumerated above may be brought into the State of Florida from the above designated areas when found upon inspection to be free from infestation of Japanese beetle and shall have been prepared and shipped in accordance with the rules and regulations of the Federal Horticultural Board and shall have attached thereto a valid certificate of the Federal Horticultural Board to that effect, when such certificate is required, and shall in other respects conform to the rules and regulations of the State Plant Board of Florida applying to the shipment of nursery stock into the state.

Rule 32. DECLARING CERTAIN AREAS IN OTHER STATES TO BE INFESTED WITH THE EUROPEAN CORN BORER. Under the provisions of the Florida Plant Act of 1927, the State Plant Board of Florida finds that the European corn borer *(Pyrausta nubilalis* Hubn.), a destructive enemy of corn and other crops, an insect pest which does not occur in the State of Florida, now exists in the following states, to-wit: Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia. And the State Plant Board of Florida further determines that a quarantine is necessary in order to protect the agricultural and horticultural interests of this state. The Board specifies the following plants and plant products originating in the areas now designated, or that may be hereafter designated by the Federal Horticultural Board as infested

with the European corn borer *(Pyrausta nubilalis* Hubn.), as infested or likely to become infested with this insect pest, to-wit:

(1) Corn and broom corn (including all parts of the stalk), all sorghums, sudan grass, celery, green beans in the pod, beets with tops, rhubarb, oat and rye straw as such or when used as packing, cut flowers or entire plants of chrysanthemum, aster, cosmos, zinnia, hollyhock, and cut flowers or entire plants of gladiolus and dahlia, except the bulbs thereof, without stems, from infested areas in Massachusetts, New Hampshire, Maine, Rhode Island, Connecticut.

(2) Corn and broom corn (including all parts of the stalk), all sorghums, and sudan grass from infested areas in Vermont, New York, Pennsylvania, Ohio, Michigan, New Jersey, Indiana, West Virginia.

It is therefore ordered by the State Plant Board of Florida that the introduction into the State of Florida of the plants and plant products above listed as infested or likely to become infested with this insect pest, from the areas now designated by the Federal Horticultural Board in the regulations supplemental to its Notice of Quarantine No. 43 as infested areas and from all other areas that may be hereafter found to be infested and be so designated by the Federal Horticultural Board is hereby prohibited: provided that nursery stock and greenhouse stock and the other articles enumerated above may be brought into the State of Florida from the above designated areas when found upon inspection to be free from infestation of European corn borer *(Pyrausta nubilalis* Hubn.) and shall have been prepared and shipped in accordance with the rules and regulations of the Federal Horticultural Board and shall have attached thereto a valid certificate of the Federal Horticultural Board to that effect, when required, and shall in other respects conform to the rules and regulations of the State Plant Board of Florida applying to the shipment of nursery stock into the state.

Rule 33. The importation into the State of Florida of any and all of the following plants, plant products and stone and quarry products, originating in that portion of the New England States now defined or which may hereafter be so defined by the United States Department of Agriculture as being territory infested with the gipsy moth *(Porthetria dispar)*, is hereby prohibited, except that shipments of the things or articles herein enumerated may be admitted and permitted delivery in

this state when accompanied by an inspection certificate (or permit) issued by a properly authorized agent of the United States Department of Agriculture or by the proper inspection official of the state in which such shipments originate, showing that they have been inspected and found free from the gipsy moth and the larvae, pupae and eggs thereof, and plainly labelled with the names and addresses of both consignor and consignee, and in other respects conform to the rules and regulations of the State Plant Board of Florida applying to the shipment of nursery stock into the state:

All trees, plants, shrubs, vines, cuttings, grafts, buds, and all other trees and plants, or parts thereof, commonly known as nursery stock.

All forest, fruit and ornamental trees and shrubs and parts thereof.

Field-grown florists' stock, shrubs, vines, and all other plants or parts thereof for planting or propagation, except flower or vegetable seeds.

Forest-plant products, including logs, tan bark, posts, poles, railroad ties, cordwood, lumber, box-bands, and hoops.

Coniferous trees, such as spruce, fir, hemlock, pine, juniper, cedar and arbor vitae, known and described as Christmas trees, and parts thereof.

Decorative plants, such as holly and laurel, known and described as Christmas greens or greenery.

Stone and all other quarry products.

Shipments of any of the articles aforesaid, originating at any point within the area defined by the United States Department of Agriculture as being infested by the gipsy moth, arriving at any port or other destination in the State of Florida, without being accompanied by the certificate of inspection herein required, shall be subject to immediate deportation upon the order of the Plant Commissioner or his assistants, or otherwise treated as the Plant Board may direct.

Rule 34. Under the provisions of the Florida Plant Act of 1927, the State Plant Board finds that the sweet potato weevil *(Cylas formicarius* (Fab.)) is an insect pest the dissemination of which should be prevented, that sweet potato plants, vines, slips, cuttings, draws and tubers, and morning-glory *(Ipomoea* sp.) vines and roots are plants likely to become infested by said insect pest, and that the following areas are areas without the

State of Florida in which said insect pest is known to occur: The States of Texas and Louisiana; the Counties of Pearl River, Hancock, Harrison and Jackson, in the State of Mississippi; the Counties of Mobile and Baldwin in the State of Alabama; and that portion of Charlton County lying south of the right of way of the G. S. & F. Railway, in the State of Georgia. The State Plant Board determines after due investigation that a quarantine is necessary to protect the agricultural and horticultural interests of Florida. It is therefore ordered by the Board:

(a) That the movement or shipment into the State of Florida of sweet potato tubers, plants, vines, cuttings, draws and slips, and of all morning-glory tubers, vines, cuttings and slips, originating in the areas in other states designated herein by the State Plant Board as areas in which the sweet potato weevil *(Cylas formicarius* (Fab.)) occurs or which are infested by said weevil, is hereby prohibited.

(b) That the movement or shipment into the State of Florida of sweet potato plants, vines, cuttings, draws and slips, and of morning-glory plants, vines, cuttings and slips, from points in other states not included in the areas defined by the State Plant Board as infested by the sweet potato weevil *(Cylas formicarius* (Fab.)) is prohibited, unless such shipments have attached to each package, bundle, parcel or other container an official certificate of the State Inspector or other legally authorized official of the State of origin or of the federal government certifying that the material included in the container originated in an area shown by actual inspection to be apparently free from the sweet potato weevil and that the plantings and premises of the shipper had been inspected within six months prior to date of shipment and found to be apparently free from infestation.

Rule 35. The importation into Florida of all trees, plants, vines, shrubs, cuttings, scions, leaves and parts of plants from the Bahamas, Cuba, Costa Rica, India, Jamaica, and Panama Canal Zone, and from all other countries or states in which the spiny citrus whitefly *(Aleurocanthus woglumi* Ashby) (also known as the "blackfly" or "Mosca Prieta") is known to occur is hereby prohibited: provided, that this rule shall not be construed as prohibiting the importation of fruits and vegetables, the importation of which is not otherwise specifically prohibited, when such fruits or vegetables are intended for use as food

products and are not infested or infected with any injurious insect or disease or are not likely from proximity of growth or the requirements of packing and shipping, to carry infestation. It is provided, further, that this rule shall not prevent the importation of lumber, sugar, logs, canned goods, sisal hemp or manufactured articles.

Any plants or plant products, infested with the spiny citrus whitefly, arriving at any port, railway station or other place in the State of Florida, or found on any vessel or boat in the waters adjacent thereto, shall be subject to immediate confiscation and destruction by agents of the State Plant Board.

All trees, plants, or parts of plants, fruits and vegetables arriving at ports of entry or other places and excluded by the operation of this rule, even though apparently not infested, shall be immediately returned to the port from which they were shipped, or destroyed at the option of the owner, consignee or agent. In no case shall such trees, plants, etc., be allowed to be transported over, repacked or stand upon any dock, warehouse, barge or other property within the jurisdiction of the State of Florida, excepting the ship in which they were originally brought, or to which they were at once transferred.

Rule 36A. The importation of citrus fruits, sapodillas *(Achras sapote)*, guavas, mangoes, peaches, plums, apples, quinces, pears, mammee-apples, the Annonas and of other host fruits of the Mexican Fruit Fly as discovered into the State of Florida from Mexico, in which country the Mexican Fruit Fly or Morelos Orange Maggot *(Anastrepha ludens* Loew.) is known to occur, is hereby prohibited and such importations arriving at any port, railway station or other place in the State of Florida, or found in the waters adjacent thereto, shall be subject to immediate confiscation and destruction by agents of the State Plant Board.

Rule 36B. By reason of the serious situation created through the presence in certain areas in the State of Texas of the Mexican Fruit Fly or Morelos Orange Maggot *(Anastrepha ludens* Loew.) and in order to prevent the introduction of this pest into the State of Florida the shipment into or delivery within the State of Florida of all host fruits of the Mexican Fruit Fly *(Anastrepha ludens* Loew.) including citrus, apple, plum, quince, peach, pear, mango, *Achras sapote,* mamey, Annona and guava originating in or shipped from the Counties of Cameron, Hidal-

go and Willacy, or from such other and additional areas in the State of Texas as may hereafter be found to be infested by the Mexican Fruit Fly *(Anastrepha ludens* Loew.) is hereby prohibited. All such fruits arriving in the State of Florida in violation of this rule shall be subject to immediate confiscation and destruction.

Rule 36C. The importation into the State of Florida of any and all fruits, vegetables, plants or parts of plants listed by the Federal Horticultural Board as hosts of the Mediterranean Fruit Fly *(Ceratitis capitata)* from Africa (Cape Colony, Congo, Delagoa, Dahomey, Nigeria, Transvaal and Uganda), Argentine Republic, Australia, Azores, Bermuda, Brazil, Cape Verde Islands, Europe (Italy, France, Malta, Spain and Sicily), Hawaiian Islands, Madeira, New Zealand, wherein the Mediterranean Fruit Fly is known to exist, is hereby prohibited and such importations arriving at any station, port or other place within the State of Florida, or found in the waters adjacent thereto, shall be subject to immediate confiscation and destruction by agents of the State Plant Board, excepting that the following plant products may be admitted in the form herewith specified from the countries above listed as being those in which the Mediterranean Fruit Fly is known to exist: coffee beans, figs, (dried), lemons.

Rule 36D. On account of the danger of introducing the destructive insect known as the West Indian Fruit Fly *(Anastrepha fraterculus* Wied.) and of other dangerous insects of the fruit-fly family (Trypetidae), which insects are known to be present in Mexico, Cuba and elsewhere in the West Indies and in South America and Central America, the importation into the State of Florida of the fruit of the guava, Surinam cherry, Cuban plum, mango, and of other host fruits as discovered is hereby prohibited: provided, that this prohibition shall not apply to the manufactured products made from these fruits. Importations of guavas, Surinam cherries, Cuban plums, mangoes and other host fruits arriving in Florida in violation of this rule shall be subject to immediate confiscation and destruction.

Rule 36E. On account of the danger of introducing into Florida the Mediterranean Fruit Fly *(Ceratitis capitata* Wied.), the West Indian Fruit Fly *(Anastrepha fraterculus* Wied.), the Mexican Fruit Fly or Morelos Orange Maggot *(Anastrepha ludens* Loew.) and other dangerous insects of the fruit-fly family

(Trypetidae), the shipment of citrus fruits originating in the Republic of Cuba into the State of Florida for delivery therein is prohibited. Shipments of citrus fruits arriving in Florida in violation of this rule shall be subject to confiscation and destruction.

Rule 37. The importation into the State of Florida of banana plants or bulbs and the importation of coconut trees, plants or nuts is hereby prohibited: provided, that this rule shall not apply to the importation of coconuts with the husks removed and not to be used for planting, nor to coconuts in the husk when such have been so treated as to render them unfit for propagation.

Rule 38. The importation into the State of Florida of pineapple plants, slips, roots, fruits and all parts thereof, from Jamaica, in which country the Pineapple Black Weevil *(Metamasius ritchiei)* is known to exist, is hereby prohibited: provided, that this rule shall not prohibit the importation from Jamaica of canned pineapple or of processed pineapple juice.

Rule 39. In order to prevent the introduction from foreign countries of insects and diseases affecting the tung-oil tree *(Aleurites fordi* and other species of *Aleurites)*, the shipment into the State of Florida and the planting within the State of Florida of seed of the tung-oil tree and of tung-oil trees imported from China or other foreign countries is hereby prohibited: provided, however, that this rule shall not be construed as preventing the use of imported tung-oil tree seed for experimental purposes by the University of Florida Experiment Station and the United States Department of Agriculture, when such seed have been imported under such conditions as to inspection and disinfection as may be prescribed or approved by the Federal Horticultural Board.

Rule 40. In order to prevent the introduction into or the spread within the State of Florida of the greater bulb fly *(Merodon equestris* Fab.), the lesser bulb fly *(Eumerus strigatus* Fallen), the bulb eel worm *(Tylenchus dipsaci* Kuehn) or other insect pests or plant diseases affecting narcissus bulbs and various other bulbs and plants, the movement of narcissus bulbs into the State of Florida or within the state is prohibited unless such movement is in accordance with the provisions of Quarantine No. 62 of the Federal Horticultural Board and of the regulations promulgated thereunder.

Rule 41A. In accordance with the provisions of Section 4 of Chapter 12050, Laws of Florida, the shipment or movement into this State, from other states and countries, of used or secondhand bee hives, honeycombs, frames and other beekeeping fixtures is hereby prohibited except when such shipments are accompanied by the certificate of the State Entomologist, State Apiary Inspector or corresponding official of the state or country from which said equipment is shipped or moved to the effect that the apiary in which such equipment originated has been inspected and found apparently free from contagious and infectious diseases; provided, that in the absence of facilities for such inspection and certification, the Plant Commissioner may issue permits for the shipment into this State of such secondhand equipment upon the presentation of suitable evidence going to show that it is not likely to convey any contagious or infectious disease of honeybees, or upon its being properly disinfected.

Rule 41B. In accordance with the provisions of Chapter 12050, Laws of Florida, a quarantine is hereby placed by the State Plant Board of Florida on all apiaries, beeyards and colonies of bees, within this State, wherein American foul brood, European foul brood or other contagious or infectious disease of honeybees is known to exist and hereafter such quarantine shall become effective upon all apiaries, beeyards or colonies of bees wherein American foul brood, European foul brood or other contagious or infectious disease is discovered. The removal of any and all colonies of bees, queen bees, nuclei and combs from such diseased and quarantined apiaries is hereby prohibited until such time as the Plant Board shall have determined and declared that the disease is apparently eradicated from such diseased or infected apiary. The movement of bee hives, frames, supers, extractors and other mechanical equipment from apiaries under quarantine as aforesaid is hereby prohibited except when such equipment is first disinfected under the supervision of an agent of the Board.

Rule 41C. The exposure by any person of hives, combs, brood or honey from colonies or apiaries which are or have been infected with American or European foul brood or other contagious or infectious disease in such a manner as to expose other bees to the danger of infection, is hereby prohibited and such exposure of hives, combs, brood or honey from infected

colonies or apiaries shall be considered a violation of Chapter 12050, Laws of Florida.

Rule 41D. The sale, bartering or shipment of queen bees and their attendant bees within this State is hereby prohibited except when accompanied by a copy of a certificate of the current year from a government Apiary Inspector or a duly authorized inspector of the State Plant Board of Florida to the effect that the apiary from which said queen bees are shipped is apparently free from disease or by a copy of a statement by the queen-breeder or beekeeper, made before a notary public or other officer having a seal, that the honey used in making the candy used in the queen mailing cage has been diluted and boiled in a tightly closed vessel.

Rule 41E. The shipment, transportation or movement of honey from the premises of any apiary which is infected with American foul brood or which is under quarantine, on account of the disease having been found therein, in accordance with the provisions of Rule 41B, except when such honey is contained in new standard square five gallon tin honey cans, free from leaks and free from all traces of honey on the outside and securely crated in regulation honey or "export" wooden cases is hereby forbidden.

The gift, sale or offering for sale, within the State of Florida of honey produced in any apiary which is infected with American foul brood or which is under quarantine by the State Plant Board on account of the disease having been found therein is hereby prohibited.

Rule 41F. Every apiary, beeyard or colony of bees, situated in the State of Florida which is, has been or shall become infected with either of the diseases known as American foul brood and European foul brood is hereby declared to be the center of an infected and dangerous zone, which zone shall extend for two miles in every direction from said center and within which center and zone all honeybees are declared to be exposed to the danger of infection and likely to harbor and disseminate such infection.

The movement of honeybees into such zone, the movement of honeybees and used beekeeping equipment within such zone and the removal therefrom of honeybees or used beekeeping equipment is prohibited: provided, that honeybees or used beekeeping equipment may be moved within such zone or removed there-

from after they have been inspected by a duly qualified agent of the State Plant Board and certified as being apparently free from infection.

The keeping, within such zone, of honeybees in box-hives, log "gums" or other form of hive not permitting of the ready removal of all frames and combs therefrom for inspection or in attics, cellars, buildings or other situations wherein adequate and efficient inspection is difficult or impossible is hereby prohibited.

Whenever inspection discloses that honeybees are being kept in box-hives or similar containers or in situations where efficient inspection is difficult or impossible within such zone the Plant Commissioner shall cause written notice to be served upon the owner or other person in possession or control of such bees or, if the owner cannot be found, upon the owner or person in possession or control of the premises whereon said bees are located, requiring such owner or other person to transfer such bees to movable frame hives or to place them in an accessible situation within a reasonable time thereafter. In event such owner or other person shall fail or neglect to carry out the requirements of said order within the time specified then and in that event such colonies of bees shall be destroyed by the inspector of the State Plant Board for the purpose of preventing their harboring and perpetuating infection.

All the requirements of this rule shall remain in force and effect in every such zone until such time as the Plant Board shall have determined and declared that the dangerous conditions due to the occurrence of American or European foul brood no longer exist therein.

Rule 41G. Every person in this state who owns or has in his possession honeybees or beekeeping equipment shall upon the request of an inspector of the State Plant Board furnish said inspector a complete inventory of all honeybees and beekeeping equipment owned or possessed by him and shall point out same to said inspector so that the honeybees and beekeeping equipment so owned or possessed may be properly inspected and reported by said inspector.

SUMMARY OF ORDERS AND REGULATIONS OF THE POST OFFICE DEPARTMENT

RELATIVE TO PARCEL POST SHIPMENTS OF NURSERY STOCK AND CERTAIN OTHER PLANTS AND PLANT PRODUCTS

Nursery Stock—Not Admitted to Mails Unless Accompanied by Certificate of Inspection

The following summary of the regulations of the Postal Service applying to shipment of plants and plant material by mail is published for the information and guidance of the public. For detailed information as to the requirements of the Post Office Department, interested parties should consult postmasters. Inquiries may also be addressed to the Plant Commissioner, Gainesville, Florida.

SUMMARY

Under the provisions of Sections 467 and 468 of the Postal Laws and Regulations and of Section 62 of the Official Postal Guide, July, 1927:

All packages of plants and plant products tendered for mailing to points in Florida must be plainly labelled to show the nature of the contents.

A list of the various plants and plant products subject to inspection is given in the sections mentioned above.

Parcel-post packages of plants and plant products, originating in Florida, bearing the inspection certificate tag of the State Plant Board of Florida, when addressed to Florida points, may be sent direct to addressee: therefore, such packages do not have to be sent to the post office at Gainesville, Jacksonville, Tampa, Pensacola, West Palm Beach or Miami, Florida, for inspection.

All packages of plants and plant products (except vegetable and flower seeds and soft bodied plants) from other states addressed to post offices in Florida are required sent to one of the above mentioned post offices for inspection.

An inspection certificate issued by the state officials of any state other than Florida does not entitle plants or plant products to delivery in Florida without being subjected to terminal inspection.

"Florida Permit Tags", accompanying mail shipments of plants or plant products, originating in another state, addressed

to Florida post offices, do not exempt such shipments from the requirements of the section mentioned above: therefore, such shipments are subject to terminal inspection.

Mail shipments of plants and plant products, originating in Florida, but addressed to post offices in other states, are not subject to inspection by Florida authorities. However, Section 167, P. L. and R., requires that all mail shipments of nursery stock (regardless of destination) shall have an official certificate of inspection attached when tendered for mailing.

All packages of plants or plant products (except as previously noted), addressed to post offices in Florida, are subject to inspection and are required to be sent to the nearest point where terminal inspection is maintained, i. e., Gainesville, Jacksonville, Tampa, Pensacola, West Palm Beach or Miami.

CONCERNING PARCELS FOR DELIVERY IN FLORIDA

FROM OTHER STATES

Postmasters within the State of Florida shall forward for inspection by the State Plant Board of Florida before delivery, parcels containing any of the following materials:

Cuttings
Flowers
Fruit
Leaves
Nuts
Plants, or any part of, except soft-bodied
Seeds, except vegetable and flower seeds
Trees, or any unmanufactured part of
Vines, or cuttings thereof

FROM FLORIDA POST OFFICES

Florida postmasters shall forward parcels containing any of the following materials for inspection by the State Plant Board of Florida before delivery unless already accompanied by a certificate of inspection of the State Plant Board:

Banana plants
Citrus flowers or leaves
Shrubs or cuttings thereof
Strawberry plants
Sweet potatoes for any use
Sweet potato vines, draws or slips
Trees, or cuttings thereof for propagation
Tree seeds other than edible nuts
Vines of a woody nature or cuttings thereof.

NOTE: Shrubs and vines of a woody nature such as rose bushes, grape vines, blackberry vines, hibiscus, etc., are subject to inspection. Soft plants such as pansy plants, cabbage plants, etc., except as named above, are not subject to inspection irrespective of origin.

IMPORTANT

In order that packages of plants and plant products sent to inspection stations for inspection and certification may be handled promptly the package should be accompanied by a sufficient number of *uncancelled* stamps for forwarding to destination. The uncancelled stamps may be enclosed, together with the forwarding address, in an envelope placed inside the package or the stamps may be attached to an inner wrapper upon which is shown the forwarding address.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

WILMON NEWELL, *Plant Commissioner*..*Editor*

ASSOCIATE EDITORS

E. W. BERGER..*Entomologist*
J. C. GOODWIN..*Nursery Inspector*
J. H. MONTGOMERY..*Quarantine Inspector*
O. F. BURGER..*Plant Pathologist*

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

DEPARTMENT REPORTS

BEE DISEASE ERADICATION

REPORT FOR MONTH OF SEPTEMBER, 1927

Number of apiaries inspected	339
Number of colonies inspected	3,309
Number of apiaries infected with American foul brood	5
Number of colonies infected with American foul brood	10
Number of colonies destroyed	10
Number of apiaries infected with European foul brood	0
Number of colonies infected with European foul brood	0
Number of colonies destroyed	0

NURSERY INSPECTION DEPARTMENT

NURSERY INSPECTOR'S SUMMARY FOR MONTH ENDING SEPTEMBER 30, 1927

Number of nurseries inspected		875
Quantity of stock inspected:		
Citrus	8,442,338	
Non-Citrus	10,983,415	
Total		19,425,753

QUARANTINE DEPARTMENT

Quarantine Inspector's Monthly Summary
September, 1927

Ships and Vessels Inspected:			
From Foreign Ports—			
Direct	177		
Via U. S. Ports	40		
Total		217	
From U. S. Ports other than Florida		142	
From Florida Ports		50	
Total			409
Number of Parcels Inspected:			
Arriving by water:			
Passed		19,583	
Treated and passed		76,504	
Returned to shipper		269	
Contraband destroyed		86	
Total			96,442
Arriving by land—express, freight, wagon, etc.:			
Passed		1,487	
Treated and passed		1	
Returned to shipper		23	
Contraband destroyed		2	
Total			1,513
Arriving by mail:			
Passed		46	
Treated and passed		0	
Returned to shipper		1	
Contraband destroyed		2	
Total			49
Grand Total of Parcels Inspected			98,004
Number of parcels on hand pending determination as to final disposition			4

DEPARTMENT OF CITRUS CANKER ERADICATION

Report on Eradication Work in Cooperation With the Bureau of Plant Industry, United States Department of Agriculture, for Month Ending September 30, 1927

Citrus grove trees inspected	1,240,820
Citrus nursery trees inspected	93,498
Inspectors employed on citrus canker eradication	32
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

General Summary

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15,158
Nursery trees found infected since May, 1914	342,260
Number properties found infected to September 30, 1927	513
Properties declared no longer danger centers	512
Properties still classed as actively infected September 30, 1927	1

Department of Citrus Canker Eradication (Report Continued)

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to September 30, 1927:

1914		1915		1916		1917		1918		1919		1920	
Jan.		Jan.	306	Jan.	86	Jan.	14	Jan.	0	Jan.	0	Jan.	0
Feb.		Feb.	165	Feb.	21	Feb	4	Feb	1	Feb.	0	Feb.	0
Mar.		Mar.	444	Mar.	49	Mar.	9	Mar.	1	Mar.	1	Mar.	0
Apr.		Apr.	408	Apr.	49	Apr.	169	Apr.	2	Apr.	1	Apr.	0
May	108	May	1042	May	338	May	52	May	1	May	1	May	0
Jun.	160	Jun.	772	Jun.	450	Jun.	45	Jun.	10	Jun.	0	Jun.	0
Jul.	275	Jul.	651	Jul.	349	Jul.	39	Jul.	0	Jul.	0	Jul.	539
Aug.	1313	Aug.	1345	Aug.	219	Aug.	30	Aug.	0	Aug.	1	Aug.	1
Sept.	767	Sept.	618	Sept.	124	Sept	6	Sept.	0	Sept.	0	Sept.	0
Oct.	565	Oct.	214	Oct.	451	Oct.	2	Oct	0	Oct.	0	Oct.	0
Nov.	773	Nov.	494	Nov.	131	Nov.	1	Nov.	0	Nov.	0	Nov.	0
Dec.	366	Dec.	256	Dec.	27	Dec.	1	Dec.	0	Dec.	0	Dec.	0
Total	4327	Total	6715	Total	2294	Total	372	Total	15	Total	4	Total	540

1921		1922		1923		1924		1925		1926		1927	
Jan.	0	Jan.	0	Jan	1	Jan.	0	Jan.	0	Jan	0	Jan	0
Feb.	0	Feb.	0	Feb.	1	Feb.	0	Feb.	0	Feb.	0	Feb.	0
Mar.	0	Mar.	0	Mar.	2	Mar.	0	Mar.	5	Mar.	0	Mar	0
Apr.	0	Apr.	0	Apr.	3	Apr	0	Apr.	0	Apr	0	Apr	0
May	0	May	585	May	2	M-y	0	May	0	May	0	May	0
Jun.	0	Jun.	168	Jun.	1	Jun.	0	Jun.	0	June	0	June	0
July	0	Jul.	28	Jul.	0	Jul	0	Jul.	0	July	0	July	0
Aug.	0	Aug.	34	Aug.	0	Aug	0	Aug	0	Aug	0	Aug	0
Sept.	0	Sept.	23	Sept.	0	Sept.	0	Sept.	0	Sept	0	Sept	0
Oct.	0	Oct.	19	Oct	1	Oct.	0	Oct.	0	Oct.	0		
Nov.	0	Nov.	12	Nov.	0	Nov.	0	Nov.	0	Nov.	0		
Dec.	0	Dec.	4	Dec.	0	Dec.	0	Dec.	0	Dec.	2		
Total	0	Total	873	Total	11	Total	0	Total	5	Total	2		

THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII November, 1927 No. 5

THE FLORIDA BEE DISEASE LAW OF 1927

AN ACT To Prevent the Introduction Into and Dissemination Within the State of Florida of Contagious and Infectious Diseases of Honey Bees; Providing for the Eradication of Bee Diseases; Authorizing the State Plant Board of Florida to Make Rules and Regulations for Carrying out the Provisions of this Act and Prescribing a Penalty for Violations.

Be it Enacted by the Legislature of the State of Florida:

Section 1. All honey bees shipped or moved into the State of Florida shall be accompanied by a certificate of inspection signed by the State Entomologist, State Apiary Inspector or corresponding official of the state or country from which such bees are shipped or moved. Such certificate shall certify to the apparent freedom of the bees, and their combs and hives, from contagious and infectious diseases and must be based upon an actual inspection of the bees themselves within a period of sixty days preceding date of shipment; provided, that when honey bees are to be shipped into this State from other states or countries wherein no official Apiary Inspector or State Entomologist is available the State Plant Board of Florida may issue permit for such shipment upon presentation of suitable evidence showing such bees to be free from disease; and provided, further, that the provisions of this section shall not apply to shipments of live bees in wire cages, when without combs or honey.

Section 2. The State Plant Board of Florida shall have full and plenary power to deal with American and European foul brood, Isle of Wight disease and all other contagious or infectious diseases of honey bees which, in its opinion, may be prevented, controlled or eradicated; and shall have full power and is hereby authorized to make, promulgate and enforce such rules, ordinances and regulations and to do and perform such acts, through its agents or otherwise, as in its judgment may be necessary to control, eradicate or prevent introduction, spread or dissemination of any and all contagious diseases of honey

bees as far as may be possible and all such rules, ordinances, and regulations of said Plant Board shall have the force and effect of law.

Section 3. The State Plant Board, its agents and employees, shall have authority to enter any depot, express office, storeroom, warehouse or premises for the purpose of inspecting any honey bees or beekeeping fixtures or appliances therein or thought to be therein, for the purpose of ascertaining whether said bees or fixtures are infected with any contagious or infectious diseases or which they may have reason to believe have been or are being transported in violation of any of the provisions of this Act.

The said Board through its agents or employees may require the removal from this State of any honey bees or beekeeping fixtures which have been brought into the State in violation of the provisions of this Act, or if finding any honey bees or fixtures infected with any contagious or infectious disease or if finding that such bees or fixtures have been exposed to danger of infection by such diseases, may require the destruction, treatment or disinfection of such infected or exposed bees, hives, fixtures or appliances.

Section 4. The shipment or movement into this State of any used or second-hand bee hives, honey combs, frames or other beekeeping fixtures is hereby prohibited except under such rules and regulations as may be prescribed by the State Plant Board in accordance with Section 2 of this Act.

Section 5. Any person, firm or corporation violating any of the provisions of this Act or of the rules and regulations of the State Plant Board adopted in accordance with the provisions of this Act shall be deemed guilty of a misdemeanor and upon conviction shall be punished by a fine of not less than Twenty-five nor more than Five Hundred Dollars, or by imprisonment for not more than six months in the county jail.

Section 6. All laws and parts of laws inconsistent with the provisions of this Act are hereby repealed.

Section 7. This Act shall take effect upon its becoming a law.

Approved June 6, 1927.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

WILMON NEWELL, *Plant Commissioner*........*Editor*

ASSOCIATE EDITORS

E. W. BERGER........*Entomologist*
J. C. GOODWIN........*Nursery Inspector*
J. H. MONTGOMERY........*Quarantine Inspector*
O. F. BURGER........*Plant Pathologist*

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

RULES AND REGULATIONS MADE BY THE STATE PLANT BOARD PURSUANT TO THE FLORIDA BEE DISEASE LAW OF 1927*

Rule 41A. In accordance with the provisions of Section 4 of Chapter 12050, Laws of Florida, the shipment or movement into this State, from other states and countries, of used or secondhand bee hives, honeycombs, frames and other beekeeping fixtures is hereby prohibited except when such shipments are accompanied by the certificate of the State Entomologist, State Apiary Inspector or corresponding official of the state or country from which said equipment is shipped or moved to the effect that the apiary in which such equipment originated has been inspected and found apparently free from contagious and infectious diseases; provided, that in the absence of facilities for such inspection and certification, the Plant Commissioner may issue permits for the shipment into this State of such secondhand equipment upon the presentation of suitable evidence go-

*Adopted September 12, 1927 Effective January 1 1928 The present rules of the Board continue operative until December 31, 1927.

ing to show that it is not likely to convey any contagious or infectious disease of honeybees, or upon its being properly disinfected.

Rule 41B. In accordance with the provisions of Chapter 12050, Laws of Florida, a quarantine is hereby placed by the State Plant Board of Florida on all apiaries, beeyards and colonies of bees, within this State, wherein American foul brood, European foul brood or other contagious or infectious disease of honeybees is known to exist and hereafter such quarantine shall become effective upon all apiaries, beeyards or colonies of bees wherein American foul brood, European foul brood or other contagious or infectious disease is discovered. The removal of any and all colonies of bees, queen bees, nuclei and combs from such diseased and quarantined apiaries is hereby prohibited until such time as the Plant Board shall have determined and declared that the disease is apparently eradicated from such diseased or infected apiary. The movement of bee hives, frames, supers, extractors and other mechanical equipment from apiaries under quarantine as aforesaid is hereby prohibited except when such equipment is first disinfected under the supervision of an agent of the Board.

Rule 41C. The exposure by any person of hives, combs, brood or honey from colonies or apiaries which are or have been infected with American or European foul brood or other contagious or infectious disease in such a manner as to expose other bees to the danger of infection, is hereby prohibited and such exposure of hives, combs, brood or honey from infected colonies or apiaries shall be considered a violation of Chapter 12050, Laws of Florida.

Rule 41D. The sale, bartering or shipment of queen bees and their attendant bees within this State is hereby prohibited except when accompanied by a copy of a certificate of the current year from a government Apiary Inspector or a duly authorized inspector of the State Plant Board of Florida to the effect that the apiary from which said queen bees are shipped is apparently free from disease or by a copy of a statement by the queen-breeder or beekeeper, made before a notary public or other officer having a seal, that the honey used in making the candy used in the queen mailing cage has been diluted and boiled in a tightly closed vessel.

Rule 41E. The shipment, transportation or movement of honey from the premises of any apiary which is infected with

American foul brood or which is under quarantine, on account of the disease having been found therein, in accordance with the provisions of Rule 41B, except when such honey is contained in new standard square five gallon tin honey cans, free from leaks and free from all traces of honey on the outside and securely crated in regulation honey or "export" wooden cases is hereby forbidden.

The gift, sale or offering for sale, within the State of Florida of honey produced in any apiary which is infected with American foul brood or which is under quarantine by the State Plant Board on account of the disease having been found therein is hereby prohibited.

Rule 41F. Every apiary, beeyard or colony of bees, situated in the State of Florida which is, has been or shall become infected with either of the diseases known as American foul brood and European foul brood is hereby declared to be the center of an infected and dangerous zone, which zone shall extend for two miles in every direction from said center and within which center and zone all honeybees are declared to be exposed to the danger of infection and likely to harbor and disseminate such infection.

The movement of honeybees into such zone, the movement of honeybees and used beekeeping equipment within such zone and the removal therefrom of honeybees or used beekeeping equipment is prohibited: provided, that honeybees or used beekeeping equipment may be moved within such zone or removed therefrom after they have been inspected by a duly qualified agent of the State Plant Board and certified as being apparently free from infection.

The keeping, within such zone, of honeybees in box-hives, log "gums" or other form of hive not permitting of the ready removal of all frames and combs therefrom for inspection or in attics, cellars, buildings or other situations wherein adequate and efficient inspection is difficult or impossible is hereby prohibited.

Whenever inspection discloses that honeybees are being kept in box-hives or similar containers or in situations where efficient inspection is difficult or impossible within such zone the Plant Commissioner shall cause written notice to be served upon the owner or other person in possession or control of such bees or, if the owner cannot be found, upon the owner or person in pos-

session or control of the premises whereon said bees are located, requiring such owner or other person to transfer such bees to movable frame hives or to place them in an accessible situation within a reasonable time thereafter. In event such owner or other person shall fail or neglect to carry out the requirements of said order within the time specified then and in that event such colonies of bees shall be destroyed by the inspector of the State Plant Board for the purpose of preventing their harboring and perpetuating infection.

All the requirements of this rule shall remain in force and effect in every such zone until such time as the Plant Board shall have determined and declared that the dangerous conditions due to the occurrence of American or European foul brood no longer exist therein.

Rule 41G. Every person in this state who owns or has in his possession honeybees or beekeeping equipment shall upon the request of an inspector of the State Plant Board furnish said inspector a complete inventory of all honeybees and beekeeping equipment owned or possessed by him and shall point out same to said inspector so that the honeybees and beekeeping equipment so owned or possessed may be properly inspected and reported by said inspector.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEPARTMENT REPORTS

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S MONTHLY SUMMARY

OCTOBER, 1927

SHIPS AND VESSELS INSPECTED:			
From Foreign Ports:			
Direct	172		
Via U. S. Ports	36		
Total		208	
From U. S. Ports other than Florida		161	
From Florida Ports		63	
Total			432
NUMBER OF PARCELS INSPECTED:			
Arriving by water:			
Passed		34,275	
Treated and passed		96,014	
Returned to shipper		330	
Contraband destroyed		105	
Total			130,724
Arriving by land—express, freight, wagon, etc.:			
Passed		1,422	
Treated and passed		151	
Returned to shipper		15	
Contraband destroyed		23	
Total			1,611
Arriving by mail:			
Passed		109	
Treated and passed		2	
Returned to shipper		6	
Contraband destroyed		3	
Total			120
GRAND TOTAL OF PARCELS INSPECTED			.132,455
Number of parcels on hand pending determination as to final disposition			0

BEE DISEASE ERADICATION

REPORT FOR MONTH OF OCTOBER, 1927

Number of apiaries inspected	210
Number of colonies inspected	2,861
Number of apiaries infected with American foul brood	1
Number of colonies infected with American foul brood	1
Number of colonies destroyed	1
Number of apiaries infected with European foul brood	0
Number of colonies infected with European foul brood	0
Number of colonies destroyed	0

NURSERY INSPECTION DEPARTMENT

Nursery Inspector's Summary for Month of October, 1927

Number nurseries inspected		1,041
Quantity of stock inspected:		
Citrus	7,548,612	
Non-citrus	11,171,430	
Total		18,720,042

DEPARTMENT OF CITRUS CANKER ERADICATION

Report on Eradication Work in Cooperation with the Bureau of Plant Industry, United States Department of Agriculture, for Month of October, 1927

Citrus grove trees inspected	1,109,963
Citrus nursery trees inspected	108,392
Inspectors employed on citrus canker eradication	32
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

General Summary

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15,158
Nursery trees found infected since May, 1914	342,260
Number properties found infected to October 31, 1927	513
Properties declared no longer danger centers	512
Properties still classed as actively infected, October 31, 1927	1

Department of Citrus Canker Eradication (Report Continued)

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to October 31, 1927:

1914		1915		1916		1917		1918		1919		1920	
Jan		Jan.	306	Jan.	86	Jan.	14	Jan.	0	Jan.	0	Jan.	0
Feb		Feb.	165	Feb.	21	Feb.	4	Feb.	1	Feb.	0	Feb	0
Mar.		Mar.	444	Mar.	49	Mar.	9	Mar	1	Mar.	1	Mar.	0
Apr.		Apr.	408	Apr.	49	Apr.	169	Apr.	2	Apr.	1	Apr.	0
May	108	May	1042	May	338	May	52	May	1	May	1	May	0
Jun	160	Jun.	772	Jun	450	Jun.	45	Jun.	10	Jun.	0	Jun.	0
Jul.	275	Jul.	651	Jul	349	Jul.	39	Jul.	0	Jul.	0	Jul.	539
Aug.	1313	Aug.	1345	Aug	219	Aug.	30	Aug.	0	Aug.	1	Aug.	1
Sept.	767	Sept.	618	Sept.	124	Sept.	6	Sept.	0	Sept.	0	Sept.	0
Oct	565	Oct.	214	Oct.	451	Oct.	2	Oct	0	Oct.	0	Oct.	0
Nov.	773	Nov.	494	Nov.	131	Nov.	1	Nov.	0	Nov.	0	Nov.	0
Dec.	366	Dec	256	Dec	27	Dec	1	Dec	0	Dec.	0	Dec.	0
Total	4327	Total	6715	Total	2294	Total	372	Total	15	Total	4	Total	540

1921		1922		1923		1924		1925		1926		1927	
Jan.	0	Jan.	0	Jan	1	Jan.	0	Jan.	0	Jan.	0	Jan	0
Feb.	0	Feb.	0	Feb.	1	Feb.	0	Feb.	0	Feb.	0	Feb.	0
Mar	0	Mar.	0	Mar.	2	Mar	0	Mar.	5	Mar	0	Mar	0
Apr.	0	Apr.	0	Apr	3	Apr.	0	Apr.	0	Apr.	0	Apr.	0
May	0	May	585	May	2	May	0	May	0	May	0	May	0
Jun.	0	Jun	168	Jun	1	Jun.	0	Jun.	0	June	0	June	0
July	0	Jul	28	Jul.	0	Jul.	0	Jul	0	July	0	July	0
Aug	0	Aug.	34	Aug.	0	Aug.	0	Aug	0	Aug.	0	Aug.	0
Sept.	0	Sept.	23	Sept.	0	Sept.	0	Sept.	0	Sept.	0	Sept.	0
Oct.	0	Oct.	19	Oct.	1	Oct.	0	Oct.	0	Oct	0	Oct	0
Nov.	0	Nov.	12	Nov.	0	Nov.	0	Nov.	0	Nov.	0		
Dec.	0	Dec.	4	Dec.	0	Dec	0	Dec	0	Dec.	2		
Total	0	Total	878	Total	11	Total	0	Total	5	Total	2		

THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII December, 1927 No. 6

NOTICE TO NURSERYMEN AND DEALERS IN NURSERY STOCK

IMPORTANT CHANGES IN RULES TO BECOME EFFECTIVE WITH NEW YEAR

The State Plant Board urges all nurserymen and dealers in nursery stock in the state to familiarize themselves with the new rules and regulations effective January 1, 1928, in order that no delay or interruption of business may result from the adoption of the new rules and regulations. It is the desire of the Board to aid and assist nurserymen and dealers of the state in adjusting themselves to the change. With this end in view attention is hereby called to some of the more important changes.

Probably the outstanding feature of the new rules and regulations is the change from a perpetual tag to an annual tag. In making this change Florida falls in line with the other states of the Union. The annual tag is now universally required by all the states. All outstanding nursery certificate tags and dealer's tags become void on January 1, 1928, and on or before that date are required to be returned to the Nursery Inspector at Gainesville. A refund of the cost of all tags will be made to all nurserymen and dealers who return their unused tags and properly acccunt for tags used.

It will be unlawful for nurserymen or dealers to use the certificates which they now hold after December 31, 1927. Application may now be made for the new series of tags to be used between January 1st and June 30th, the end of the business year, when the new tags will expire. (See Rule 10.) Tags ordered now will be sent out in ample time to reach destination by January 1st. There will be no change in prices of tags, which are as follows:

Less than 100	3c each	800	$ 6.45
100	$2.40	900	7.05
200	3.05	1000	7.20
300	3.47	2000	12.50
400	4.15	3000	18.00
500	4.75	4000	23.50
600	5.30	5000	29.00
700	5.90	Each added 1000	5.50

All orders must be accompanied by remittance to cover cost of same. Do not send checks for less than $1.00.

Blank invoices will be supplied without cost with all orders for less than 100 tags. With orders for 100 or more tags, invoices will be furnished at 25 cents per hundred.

All persons ordering new tags are cautioned to limit their orders to the number needed between January 1 and June 30, 1928, since all unused tags must be returned at their expiration on June 30th and no refund will be made for tags returned at that time. It is preferable to order too few rather than too many, since additional tags may be secured promptly at any time on request.

Another important change in the rules is with reference to the defoliation of nursery stock. The old rule required the defoliation of all nursery stock that would tolerate defoliation. Under the new rule defoliation is required of citrus stock only. (See Rule 8, Sec. C.)

Old Rule 4J which required the scrubbing of all host plants of cottony-cushion scale has been repealed. This rule was adopted at a time when cottony-cushion scale was confined to a few reasonably well defined areas in the state and for a long time served a useful purpose in delaying the spread of this scale. At the present time it is pretty generally distributed over the state. For this reason and also the further reason that a very satisfactory method of control has been found, the Board has reached the conclusion that the further continuance of this rule would serve no useful purpose and should therefore be repealed.

In addition to the changes noted above all the rules have been rearranged and renumbered and in some instances the wording has been changed in an effort to make them clearer and more workable without changing the substance. For the purposes of this article it is deemed unnecessary to go into details with reference to these minor changes. All persons de-

siring further information with reference to any of the new rules and regulations should make application to the State Plant Board, Gainesville. All inquiries will be promptly and fully answered.

All of the rules and regulations of the Board (revised rules) as adopted by the Board at its September meeting and which will become effective January 1, 1928, have been published in their entirety in the October issue of The Monthly Bulletin (Volume XII, No. 4). Copies of this issue may be obtained upon request to the Plant Commissioner. The new Plant Act passed by the State Legislature at its 1927 session to replace the Plant Act of 1915, under which the Board has been functioning, was published in the July issue of The Monthly Bulletin (Volume XII, No. 1), copies of which may also be secured by addressing the Plant Commissioner, Gainesville, Florida.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

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WILMON NEWELL, *Plant Commissioner*..**Editor**

ASSOCIATE EDITORS

E. W. BERGER..*Entomologist*
J. C. GOODWIN..*Nursery Inspector*
J. H. MONTGOMERY ....*Quarantine Inspector*
O. F. BURGER..*Plant Pathologist*

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

CITRUS CANKER FOUND NEAR FORT LAUDERDALE

On November 10 a crew of assistant grove inspectors, while engaged in the customary scouting inspection of citrus groves, discovered an infection of citrus canker in a grove located in the outskirts of Fort Lauderdale. There were about fifteen hundred citrus trees in this grove. Of this number 422 trees ranging in age from eight to fifteen years were in one block, while the remainder—trees of about five or six years of age—were located in the second block. In the older block a total of 79 infected trees were found. The owners of the property accorded the heartiest assistance and cooperation and permitted the destruction of a total of 280 grapefruit and orange trees in the infected block. The remaining citrus trees in this block were severely cut back to stumps.

Immediately upon the discovery of the infection, there was a concentration of Plant Board inspectors at Fort Lauderdale and an intensive survey was made of all citrus in the vicinity. Only one additional infected property was found. This was a small

planting located about one-fourth mile southeast of the larger infected grove. Six lime trees were found infected by canker on this town lot. There was a direct connection through intercourse between the larger infected property and the town lot upon which the infected lime trees were found.

Following the intensive survey, a crew of ten men was left at Fort Lauderdale to continue inspection throughout the winter. It is planned to have another concentration of inspectors at Fort Lauderdale with the development of spring growth.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEPARTMENT REPORTS

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S MONTHLY SUMMARY

NOVEMBER, 1927

SHIPS AND VESSELS INSPECTED:			
From Foreign Ports:			
Direct	228		
Via U. S. Ports	47		
Total		275	
From U. S. Ports other than Florida		156	
From Florida Ports		69	
Total			500
NUMBER OF PARCELS INSPECTED:			
Arriving by water:			
Passed		19,270	
Treated and passed		99,893	
Returned to shipper		491	
Contraband destroyed		174	
Total			119,828
Arriving by land—express, freight, wagon, etc.:			
Passed		435	
Treated and passed		101	
Returned to shipper		2	
Contraband destroyed		0	
Total			538
Arriving by mail:			
Passed		215	
Treated and passed		2	
Returned to shipper		0	
Contraband destroyed		6	
Total			223
GRAND TOTAL OF PARCELS INSPECTED			120,589
Number of parcels on hand pending determination as to final disposition			0

NURSERY INSPECTION DEPARTMENT

Nursery Inspector's Summary for Month of November, 1927

Number of nurseries inspected		668
Quantity of stock inspected:		
Citrus	6,525,675	
Non-Citrus	9,004,044	
Total		15,529,719

BEE DISEASE ERADICATION

Report for Month of November, 1927

Number of apiaries inspected	89
Number of colonies inspected	1,110
Number of apiaries infected with American foul brood	0
Number of colonies infected with American foul brood	0
Number of colonies destroyed	0
Number of apiaries infected with European foul brood	0
Number of colonies infected with European foul brood	0
Number of colonies destroyed	0

DEPARTMENT OF CITRUS CANKER ERADICATION

Report on Eradication Work in Cooperation with the Bureau of Plant Industry, United States Department of Agriculture, for Month of November, 1927

Citrus grove trees inspected	500,892
Citrus nursery trees inspected	0
Inspectors employed on citrus canker eradication	33
New properties showing active infection	2
Total properties showing active infection	2
Grove trees found infected	85
Nursery trees found infected	0
Counties in which active infections were found	1

General Summary

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15.243
Nursery trees found infected since May, 1914	342,260
Number properties found infected to November 30, 1927	515
Properties declared no longer danger centers	512
Properties still classed as actively infected November 30, 1927	3

Department of Citrus Canker Eradication (Report Continued)

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to November 30, 1927:

1914		1915		1916		1917		1918		1919		1920	
Jan.		Jan.	306	Jan.	86	Jan.	14	Jan.	0	Jan.	0	Jan.	0
Feb.		Feb.	165	Feb.	21	Feb.	4	Feb.	1	Feb.	0	Feb.	0
Mar.		Mar.	444	Mar.	49	Mar.	9	Mar.	1	Mar.	1	Mar.	0
Apr.		Apr.	408	Apr.	49	Apr.	169	Apr.	2	Apr.	1	Apr.	0
May	108	May	1042	May	338	May	52	May	1	May	1	May	0
Jun.	160	Jun.	772	Jun.	450	Jun.	45	Jun.	10	Jun.	0	Jun.	0
Jul.	275	Jul.	651	Jul.	349	Jul.	39	Jul.	0	Jul.	0	Jul.	539
Aug.	1313	Aug.	1345	Aug.	219	Aug.	30	Aug.	0	Aug.	1	Aug.	1
Sept.	767	Sept.	618	Sept.	124	Sept.	6	Sept.	0	Sept.	0	Sept.	0
Oct.	565	Oct.	214	Oct.	451	Oct.	2	Oct.	0	Oct.	0	Oct.	0
Nov.	773	Nov.	494	Nov.	131	Nov.	1	Nov.	0	Nov.	0	Nov.	0
Dec.	366	Dec.	256	Dec.	27	Dec.	1	Dec.	0	Dec.	0	Dec.	0
Total	4327	Total	6715	Total	2294	Total	372	Total	15	Total	4	Total	540

1921		1922		1923		1924		1925		1926		1927	
Jan.	0	Jan.	0	Jan.	1	Jan.	0	Jan.	0	Jan.	0	Jan.	0
Feb.	0	Feb.	0	Feb.	1	Feb.	0	Feb.	0	Feb.	0	Feb.	0
Mar.	0	Mar.	0	Mar.	2	Mar.	0	Mar.	5	Mar.	0	Mar.	0
Apr.	0	Apr.	0	Apr.	3	Apr.	0	Apr.	0	Apr.	0	Apr.	0
May	0	May	585	May	2	May	0	May	0	May	0	May	0
Jun.	0	Jun.	168	Jun.	1	Jun.	0	Jun.	0	June	0	June	0
July	0	Jul.	28	Jul.	0	Jul.	0	Jul.	0	July	0	July	0
Aug.	0	Aug.	34	Aug.	0	Aug.	0	Aug.	0	Aug.	0	Aug.	0
Sept.	0	Sept.	23	Sept.	0	Sept.	0	Sept.	0	Sept.	0	Sept.	0
Oct.	0	Oct.	19	Oct.	1	Oct.	0	Oct.	0	Oct.	0	Oct.	0
Nov.	0	Nov.	12	Nov.	0	Nov.	0	Nov.	0	Nov.	0	Nov.	85
Dec.	0	Dec.	4	Dec.	0	Dec.	0	Dec.	0	Dec.	2		
Total	0	Total	873	Total	11	Total	0	Total	5	Total	2		

THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII January, 1928 No. 7

CHANGING CONDITIONS IN PLANT QUARANTINE ACTIVITIES[†]

J. H. MONTGOMERY

If I, your chairman, were going to inflict an address upon you I know of no better subject than just this: "Compliance Rather than Enforcement". This it seems to me is a cardinal principle to be followed in plant quarantine work. My observation and experience over a good many years of activity as a plant quarantine officer lead me to the inevitable conclusion that successful plant quarantine administration invariably results from a judicious combination of education, fairness, firmness and, when necessary, a resort to force. However, as my few remarks can hardly be dignified by the term "address", I shall leave the text as a suggestion to some successor in office.

I want to take this opportunity to indulge in a few remarks on the general plant quarantine situation; to comment somewhat on changed conditions and their effect on the administration of plant quarantines; to be somewhat retrospective but not prophetic; and finally, to ask the questions and to have you ask yourselves: Where are we headed? Are we at or near the crossroads and is it not time to take account of stock, as it were, and ask ourselves the question which others have been and are asking and will continue to ask, "Is it all worth while?" And if so, how are we to get the maximum degree of protection for our horticultural activities?

CHANGED CONDITIONS—DOMESTIC QUARANTINES

Fifteen years ago, ten years ago, the administration of a domestic quarantine was a relatively easy matter. Being so, we must admit there were abuses. Too frequently quarantines were promulgated which were not fully justified. All that was necessary was a situation which could be used as a reason (or excuse) and a quarantine was immediately promulgated. And it was easily applied, too, for the only agency of importance involved

[†]A paper presented at the annual meetings of the Section on Plant Quarantine and Inspection of the Association of Economic Entomologists, Nashville, Tennessee, December 27, 1927.

was the common carrier. How different it is today. With the development of motor transport and the construction of improved public highways, the whole situation has changed. A simple problem has become one full of complexities. The opportunities for spread of plant pests through transportation have been multiplied many fold. Today—and I make this statement advisedly—the application of a domestic quarantine, especially one of a more or less general nature or one with respect to a minor pest, is a mere gesture. To efficiently administer would require an army of men to patrol our roads and act as guards where main highways, and byways also, cross our state lines or other quarantine lines. So then we may well ask ourselves, why make the effort? Why dissipate our resources on little things or abortive activities? Why not concentrate on the big things? Why worry and waste time, effort and money to intercept in transit a few (or even many) plants affected by, we will say, root knot or the commoner scales when there are *big* problems demanding attention and solution? I do not mean by that that the movement of such infested material should be encouraged. Quite the contrary. I do think, though, that means other than interception can be used to attain the results sought.

At this point let us pursue this particular phase of the subject just a little further. Nursery inspection is in all states a recognized function of plant quarantine officers. At one time it may have been thought that inspection of nursery stock would prevent dissemination of plant pests, and so it would, provided the inspection were adequate. I know of no state, however, which has an *adequate* service. Some are good and some are better than others, but *none* are *adequate*. The nearest approach, in my judgment, to an adequate service would be represented by a combination of three methods:

(a) Field inspection at frequent intervals, the frequency depending on climatic and cultural conditions.
(b) Point of origin, i. e., packing house inspection.
(c) Point of destination, i. e., terminal inspection.

In no state is this system followed. In most states faith is pinned to field inspection. In one or two states, possibly several, field and terminal inspection are followed. I know of no state that uses the triple combination.

After all, why nursery inspection? Is there any inspector who is so optimistic as to believe the customary certification to which he appends his name, the statement that the inspected plants

were free from pests, is a true and correct statement? It may have been true at the time the inspection was made, but what has happened between that time and the time the certificate tag was used? I might even go so far as to say that a rigid adherence to the laws with respect to presence of pests on nursery stock would probably result in no certificate being issued. Why not, therefore, if that be a true statement, in order to keep ourselves entirely within the facts, issue a certificate which sets forth actual conditions; as, for instance, that there is no evidence of *major* pests and the stock is otherwise in such condition as to permit of movement under certain safeguards, meaning by the latter statement that *minor* pests have not been found in abundance and that recognized prescribed methods of treatment, if followed, will obviate the likelihood of such being carried.

Why nursery inspection? In the last analysis, what is the object of nursery inspection?

I should say under present day conditions it is two-fold:

First and foremost: To prevent dissemination of pests of primary importance—major pests.

Second: To insure to the planter stock which is reasonably free from minor pests so that he will not begin his operations laboring under a handicap.

To preserve our sequence of thought and reasoning we must now revert to the subject of domestic quarantines, both interstate and intra-state. I have stated my belief that under conditions as they now are—conditions vastly different from those of ten or twelve years ago—domestic quarantines are ineffective. At best they can only be regarded as retardants and of course as such possess value. Cases in point are the Japanese beetle and corn borer quarantines, both of which are restrictive or regulatory in their nature. It must be admitted that restrictive measures are much more difficult of application than prohibitive quarantines or embargoes. Such measures, embargoes, are unquestionably justified only where enormous financial interests are involved, where basic industries are threatened. As an illustration may be cited California's prohibition, absolute, on Florida citrus fruit. As a general proposition, however, it may be stated that domestic quarantines of an absolute nature are to be approached with caution and trepidation, for there may be lack of justification and there is always the likelihood of ineffectiveness. It must be remembered that few, if any, of our

states are as fortunately situated from a quarantine administration standpoint as is California with her natural mountainous and desert barriers through which there are only a few gateways.

PORT INSPECTION

We have been discussing domestic quarantine activities which, important as they are, cannot be compared with that other and greater problem, foreign quarantines. Listen!! Every one of our major plant pests, with a few exceptions, is an invader from foreign lands. They are costing us millions of dollars annually. Are there more of them seeking entrance? There are. Do we want them? No. Can they be kept out? Yes. At least there is a good chance. Will they be kept out? *I don't know.* The above sounds as though it might have been extracted from McGuffy's First Reader. It is indeed primary, elementary. I have observed frequently that things that are perfectly obvious are overlooked or disregarded just because of that fact. I think most of us have not given sufficient thought to the bigger and broader questions of plant quarantine. State officers have been charged with having a narrow, restricted, provincial viewpoint and I don't know but what the charge has had some basis. Have we not, indeed, in the past thought too much of our own state problems rather than of national and international quarantine questions? I am happy that a change has taken place, or at least is taking place. The organization of the Regional and National Plant Quarantine Boards is evidence of this. The first great step in national plant quarantine was the creation of the Federal Horticultural Board. Of almost equal importance as an advance was the development of the plan for coordination of state and national activities through the Regional and National Boards. It is true the latter possess no legal, official, authoritative standing, but as instruments for initiating and carrying out constructive plans for improvement in the plant quarantine field their value can hardly be appraised. Too much honor and credit cannot be accorded to those men of vision and courage who conceived and carried out the idea of organization on this line. The plan is as yet in a formative stage but even so much has already been accomplished. Much more will be accomplished. It is my personal hope and expectation that through this medium the state quarantine official will be brought to appreciate more fully the importance of the foreign quarantine problem and contribute to its solution. This contribution will only come through a complete

and thorough realization and recognition of the problem and this can only be had by understanding. To the state man I would say: Don't think that because there is a Federal Horticultural Board this is none of your business. It is your business. Don't sit back and indulge in criticism of the Federal Horticultural Board because some pest is introduced or because you don't approve of some action of the Federal Horticultural Board. If and when another major pest finds its way into the United States, don't, under present conditions, place the entire responsibility on the shoulders of the Federal Horticultural Board. The Federal Horticultural Board can only have as many ports guarded as its man power will permit and can only employ as many inspectors as the budgetary provision allows. The adequacy of appropriations for carrying on this work, which is of interest and importance to all parts of this country, rests with the people affected. To you men from interior states I would say: Don't delude yourselves in the belief that this is a matter of special interest to maritime and border states. When the fruit flies slip in through some unguarded or poorly guarded port they won't stop there but, like the corn borer and the Japanese beetle, they will go marching on.

Conditions are changing in our foreign quarantine situation just as they are domestically. Rapid steamers equipped with modern refrigerating plants are bringing foreign plants and plant products nearer and nearer to us, speaking in terms of time and opportunity. New problems are constantly arising. Good roads and motor transport promise to play an important part in our relations with foreign countries, even with foreign countries separated from us by the sea. This is an amazing statement. Nevertheless, it is true. There is now being completed a state highway from the Florida mainland via a chain of small islands to Key West. At the same time the Cuban Government has launched a national road-building program, the main project of which is the construction of a seven hundred fifty mile stem from the east end of the island to the west end, all parts of the system to center at Havana. Also at the same time the P. & O. Steamship Company operating between Florida and Cuban ports, we are informed, is planning the construction of huge ferry boats to transport automobiles. Just imagine the difficulties attached to handling this situation when added to our present big problem of passenger steamers and railroad car ferries. I mention this by way of illustration. Other situations could be cited of the constant change under way.

As state men I think perhaps we, on account of our habit of provincialism, do not at all times appreciate that a quarantine problem of an international nature is not the simple problem the local quarantine is. Of course, basically the determination rests upon necessity. In addition, however, there are innumerable collateral considerations, considerations which complicate an otherwise simple and easily disposed of matter. Sometimes it is the State Department which makes certain representations as to the effect of a proposed quarantine action upon our relations with foreign countries. Sometimes it is the Commerce Department which says: What effect will this proposed measure have on our commerce with such and such a country. Sometimes it is the Treasury Department which interests itself and sometimes it is all of them. Then, too, trade and industrial organizations play their part. The United States Chamber of Commerce, labor organizations and horticultural associations, local, state and national, all take an interest and attempt to exert an influence in the formulation not only of particular quarantine action but also of national quarantine policy. And until recently the plant quarantine specialists of the country as represented by state officers have, except in rare instances, held aloof. And even now it will not be sufficient for these men to assume that this work will be done for them by their representatives on the National Plant Board. Each one has an individual and personal duty to (a) keep himself informed and (b) respond promptly and wholeheartedly when called upon.

CONCLUSION

These remarks have not been made for the purpose of precipitating an argument or of even eliciting discussion, nor do I want to be regarded as making a special plea for the Federal Horticultural Board. I hold no brief for it. It has made mistakes and will make more. So have we and so will we. I am trying to point out to you state men that your interests are coincidental with the Federal interests. It is my sincere hope that something which I have said may occasion thoughtful consideration from my hearers. It is my own well considered opinion that the ultimate answer will involve three things upon which our quarantine structure will be based:

(1) Expansion and development of port inspection service.
(2) Strengthening of nursery inspection service.
(3) Fewer domestic quarantines and only for major pests.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

In Memory of

JOSEPH LIONEL LAZONBY

Loyal friend, faithful public servant, loving husband and parent, Christian gentleman

Born at Wigton, England, June 9, 1881
Died at Ft. Lauderdale, Florida, December 28, 1927

The members of the Plant Board staff learned with great sorrow of the death of Inspector J. Lionel Lazonby, which occurred at Fort Lauderdale, Florida, on December 28, 1927, after a short illness.

Mr. Lazonby was born at Wigton, Cumberland County, England, June 9, 1881. He received his education in the public schools of England and at Aspatria Agricultural College, Cumberland. At one time he held a commission in the British army. In 1911 he came to Florida, settled at Santa Rosa, and engaged in citrus culture. For the past four or five years he has been in residence at Fort Lauderdale. On March 27, 1916, he was appointed Agent of the Bureau of Plant Industry, United States Department of Agriculture, and Inspector of the State Plant

Board of Florida, in connection with the fight which was being waged against citrus canker. These positions he continued to hold until his untimely decease. His services to the state and nation were of unusual value and his death is keenly felt by his associates, who take this method of paying tribute to his memory.

Mr. Lazonby is survived by his widow and two children, Launcelot and Muriel, of Fort Lauderdale; and by his father, a brother and two sisters, who reside in Keswick, England.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEPARTMENT REPORTS

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S MONTHLY SUMMARY

DECEMBER, 1927

SHIPS AND VESSELS INSPECTED:			
From Foreign Ports:			
Direct	216		
Via U. S. Ports	50		
Total		266	
From U. S. Ports other than Florida		165	
From Florida Ports		74	
Total			505
NUMBER OF PARCELS INSPECTED:			
Arriving by water:			
Passed		119,281	
Treated and passed		27,284	
Returned to shipper		292	
Contraband destroyed		592	
Total			147,449
Arriving by land—express, freight, wagon, etc.:			
Passed		622	
Treated and passed		61	
Returned to shipper		2	
Contraband destroyed		1	
Total			686
Arriving by mail:			
Passed		107	
Treated and passed		2	
Returned to shipper		5	
Contraband destroyed		1	
Total		115	
GRAND TOTAL OF PARCELS INSPECTED			148,250
Number of parcels on hand pending determination as to final disposition			8

NURSERY INSPECTION DEPARTMENT

NURSERY INSPECTOR'S SUMMARY FOR MONTH OF DECEMBER, 1927

Number of nurseries inspected		831
Quantity of stock inspected:		
Citrus	8,103,923	
Non-citrus	11,084,269	
Total		19,188,192

DEPARTMENT OF CITRUS CANKER ERADICATION

REPORT ON ERADICATION WORK IN COOPERATION WITH THE BUREAU OF PLANT INDUSTRY, UNITED STATES DEPARTMENT OF AGRICULTURE, FOR MONTH OF DECEMBER, 1927

Citrus grove trees inspected	537,847
Citrus nursery trees inspected	0
Inspectors employed on citrus canker eradication	33
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

GENERAL SUMMARY

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15,243
Nursery trees found infected since May, 1914	342,260
Number properties found infected to December 31, 1927	515
Properties declared no longer danger centers	512
Properties still classed as actively infected December 31, 1927	3

Department of Citrus Canker Eradication (Report Continued)

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to December 31, 1927:

1914		1915		1916		1917		1918		1919		1920	
Jan.		Jan.	806	Jan.	86	Jan.	14	Jan.	0	Jan.	0	Jan.	0
Feb.		Feb.	165	Feb.	21	Feb.	4	Feb.	1	Feb.	0	Feb.	0
Mar.		Mar.	444	Mar.	49	Mar.	9	Mar.	1	Mar.	1	Mar.	0
Apr.		Apr.	408	Apr.	49	Apr.	169	Apr.	2	Apr.	1	Apr.	0
May	108	May	1042	May	388	May	52	May	1	May	1	May	0
Jun.	160	Jun.	772	Jun.	450	Jun.	45	Jun.	10	Jun.	0	Jun.	0
Jul.	275	Jul.	651	Jul.	349	Jul.	39	Jul.	0	Jul.	0	Jul.	539
Aug.	1318	Aug.	1345	Aug.	219	Aug.	30	Aug.	0	Aug.	1	Aug.	1
Sept.	767	Sept.	618	Sept.	124	Sept.	6	Sept.	0	Sept.	0	Sept.	0
Oct.	565	Oct.	214	Oct.	451	Oct.	2	Oct.	0	Oct.	0	Oct.	0
Nov.	773	Nov.	494	Nov.	131	Nov.	1	Nov.	0	Nov.	0	Nov.	0
Dec.	366	Dec.	256	Dec.	27	Dec.	1	Dec.	0	Dec.	0	Dec.	0
Total	4327	Total	6715	Total	2294	Total	872	Total	15	Total	4	Total	540

1921		1922		1923		1924		1925		1926		1927	
Jan.	0	Jan.	0	Jan.	1	Jan.	0	Jan.	0	Jan.	0	Jan.	0
Feb.	0	Feb.	0	Feb.	1	Feb.	0	Feb.	0	Feb.	0	Feb.	0
Mar.	0	Mar.	0	Mar.	2	Mar.	0	Mar.	5	Mar.	0	Mar.	0
Apr.	0	Apr.	0	Apr.	3	Apr.	0	Apr.	0	Apr.	0	Apr.	0
May	0	May	585	May	2	May	0	May	0	May	0	May	0
Jun.	0	Jun.	168	Jun.	1	Jun.	0	Jun.	0	June	0	June	0
July	0	Jul.	28	Jul.	0	Jul.	0	Jul.	0	July	0	July	0
Aug.	0	Aug.	34	Aug.	0	Aug.	0	Aug.	0	Aug	0	Aug.	0
Sept.	0	Sept.	23	Sept.	0	Sept.	0	Sept.	0	Sept.	0	Sept.	0
Oct.	0	Oct.	19	Oct.	1	Oct.	0	Oct.	0	Oct	0	Oct.	0
Nov.	0	Nov.	12	Nov.	0	Nov.	0	Nov.	0	Nov.	0	Nov.	85
Dec.	0	Dec.	4	Dec.	0	Dec.	0	Dec.	0	Dec.	2	Dec.	0
Total	0	Total	873	Total	11	Total	0	Total	5	Total	2	Total	85

# THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII February, 1928 No. 8

HONEYBEES

By Robert E Foster

Realizing that the information coming to a lay reader about honeybees and their products is often inaccurate and jumbled, the writer has attempted to give some known facts together with recent observations in a language eliminating technicalities and scientific names so that anyone may understand.

Bees are very highly organized creatures, especially with respect to their life in the colony. There are three distinct kinds of bees in each hive or community, all working together in harmony, each performing its individual task. Human beings might profit by taking lessons from the little honeybees. Each colony has a queen, drones, or male bees, and worker bees. A colony that is strong and ready to gather a crop of honey may consist of one hundred to one hundred and fifty thousand workers, several hundred drones and one queen.

The queen bee is the most important member of the colony, as she is the mother of all. Hence, it behooves the beekeeper to be very careful in selecting the queen to head his colony, because as the queen is, so will the rest of the colony be.

Each individual bee in the colony is hatched from an egg laid by the queen in the cells of the honeycomb. A good queen will lay two thousand or more eggs per day. Three days after the egg is laid there hatches a larva or grub, so minute that it is hard to distinguish with the unaided eye. The larva is fed by the nurse bees and grows very rapidly. After five days the bees stop feeding it and seal it into the cell. Larvae which have been thus sealed are spoken of by the beekeeper as sealed or capped brood. After it is sealed in the cell the larva spins its cocoon, goes through a molt and becomes a pupa. Thirteen days after being sealed in the cell, or twenty-one days after the egg is laid, the pupa becomes fully developed, gnaws the cap from the cell and emerges as a worker bee.

The queen and the worker are hatched from the same kind

of egg, but the larva which is intended for a queen is given different food after the third day. Sixteen days after the egg is laid the queen emerges from her cell. She is a little weak and staggers slightly at first, but gains strength very rapidly. For a few days she is content to run around on the combs, but some nice warm day when the sun is shining brightly and the bees are flying strong she decides to take a flight. Out she goes and mates with a drone in the air, and then returns immediately to the hive. She is now fertilized for life and does not leave the hive again unless the colony sends out a swarm, in which case the old queen goes with the swarm. In a few days she starts laying. The mature or laying queen is graceful; her body is pointed and longer than the worker or drone. A virgin queen, that is, a queen that has never mated with a drone, can lay eggs, but they will hatch all drones. After the queen has mated she can lay an egg that will hatch a worker bee or an egg that will hatch a drone, at will. The only difference between the egg that hatches a drone and the egg that hatches a worker is that the latter has been fertilized. This has been proved by taking eggs that were laid in drone comb, fertilizing them artificially and then putting them in colonies of bees. Worker bees emerged. Queens also have been raised from these hand fertilized eggs.

There are two sizes of honeycomb in the hive, drone and worker. The cells of the drone comb are larger. The queen lays the drone eggs in these larger cells, and the worker eggs in the smaller ones. As the worker bees gather the honey, it is to the advantage of the beekeeper to have more worker than drone comb in the hive. In fact, a good beekeeper will try to keep all drone comb out of his hives, except perhaps in one that he wishes to use for breeding purposes. The artificial comb foundation has cells stamped on it the size of worker cells. Therefore, if the beekeeper uses full sheets of foundation in his brood frames he will have a colony consisting mostly of worker bees. It has been found, however, that the bees will build a few drone cells in spite of all that the beekeeper can do, but by culling out the drone comb and using foundation he can very nearly eliminate the drones.

The drone is the male bee. He emerges from his cell twenty-four days after the egg is laid. He has no father, but has a grandfather on his mother's side. In appearance the drone differs very much from the queen or worker bee. His body is broad

and his abdomen is blunt instead of pointed. He is the largest inmate of the bee colony, and also the only one that has no sting. His tongue is so short that he could not gather honey if he wanted to, but he doesn't. He simply lies around the hive and on pleasant days gets outside and buzzes. He can surely buzz. Of course, his aim in life is to mate with a queen. Upon doing this, he dies instantly. When the honey flow commences to fail the worker bees run him out, and he dies. Taking it all in all, he has a hard time. Even chickens will learn to pick him out because he cannot sting them.

The workers are undeveloped females. They do not have reproductive organs. They are hatched from fertilized eggs and emerge from the cells twenty-one days after the eggs are laid. The life cycle of the Italian bee is sixty days, but during the working season the life of a worker bee is about six weeks. In windy weather they die young, as their wings wear out. If the weather is such that bees can fly they never die inside the hive, but crawl or fly out to die in the field. In fact, if anything is wrong with a bee her sister workers pull and drive her out of the hive. In the more northern states where the bees are confined for weeks by cold weather, a great many die inside the hive. If the beekeeper does not remove them when the weather warms up, the bees will carry all of them out.

The worker bees may be divided into two general classes: inside workers and field bees. Among the inside workers are listed nurse bees, guards, comb builders, wax secreters, house cleaners, painters and varnishers, fanners and nectar evaporators.

Perhaps the first duty of a worker bee after emerging from the cell is to act as a nurse. Probably sometime during her life she performs her share of each occupation listed above. The nurse bees feed on honey, water and pollen and by means of certain glands opening into the mouth secrete a food or pap which they give to the larvae. When the fact that over ten thousand visits are made by nurse bees to each growing individual during the eight days from the time the egg is laid until the larva is capped over in the cell is taken into consideration, the magnitude of the nurse bees' job is realized.

The guards are bees that stay near the entrance of the hive and challenge everything and everybody that try to enter. When a bee lights on the alighting board, they dart out, run up to her, and, if everything is all right, allow her to enter. However,

if anything is wrong, they will drive her away. It is not known just what the password is in all instances, but it has been learned that a loaded bee, that is, a bee with a load of nectar or pollen, can go into any hive unmolested. A bee without a load can enter only its own home. During a honey flow a drone can enter any hive. That is under normal conditions. The beekeeper can alter this by changing certain conditions. If the beekeeper destroys the morale of the colony by smoking, drumming, or other handling, the guards will allow any bee to enter unmolested.

Comb builders and wax secreters must work together. It may be that comb builders are also wax secreters, and vice versa. However, the bee that secretes the wax does not always make that wax into comb. The worker bee is equipped with eight wax-plates located on the under side of the abdomen, four on each side. The wax is a secretion from the bee's body appearing on the wax-plates as little scales. These are taken by the bees with their mouthparts, ground up and moulded into honeycomb. When comb is needed, numbers of young bees feed themselves heavily with honey and then hang together in vertical sheets or festoons. After about twenty-four hours they begin to construct comb. During this period their wax glands have been actively forming scales of wax. It is necessary for the bees to consume several pounds of honey in order to secrete one pound of wax.

The house cleaners are worker bees that tear to pieces and carry out foreign matter found in the hive. Perhaps the beekeeper in his handling of the hive may get some trash, such as leaves or grass, in between the honey super and the brood chamber. The house cleaners will work at this until they clean it out.

The painters and varnishers take propolis, which is a resinous, glue-like substance, and cover the inside walls and fixtures of the hive. They fill every crack or space unless large enough for a bee to pass through. This is done as a protection against other insects. If a foreign substance gets into the hive that is too large for the house cleaners to carry out and so tough that they cannot tear it in pieces, the painters cover it with a coat of propolis. The writer has seen toads, grasshoppers, mice and lizards that were killed in the hive covered with propolis so

that there was no odor caused by decay. It appears that some of the bees should be called embalmers.

The fanners are worker bees that stand around the entrance and in other places in the hive and fan with their wings. Their duty is to keep a current of air circulating in all parts which aids in the evaporation of the nectar to honey density. They are divided into two groups, one of which fans fresh air in and the other foul air out. They also aid in lowering the temperature of the hive.

What is nectar? Mythology tells us that nectar was the drink of the gods, but the nectar which we have reference to is a sapid, sweetish substance secreted by certain flowers and plants. Not all flowers or plants secrete nectar. The nectar is secreted in nectaries or nectar glands located in the blossom or on the leaf or stem of the plant. Some plants, such as orange and clover, have nectar glands only in the blossom, while others have them in the blossom and on the leaf or stem, as cotton and partridge pea. The sugar which is present in nectar is in the form known as cane sugar or sucrose. Most of the sugar contained in honey is grape sugar in the form of dextrose and levulose. The bees change the cane sugar to grape sugar. The fact that nectar contains eighty percent water and new honey only twenty to twenty-one per cent is evidence that the little honeybee has "some job" in condensing the nectar. The primary function of nectar is to call the bees and insects to the flowers so that they, in turn, will carry the pollen from blossom to blossom.

Pollen is a fine, dust-like substance produced by the staminate flowers of all flowering plants. It is an essential substance both to plants and to various insects, particularly to honeybees. In both cases it is absolutely necessary for the perpetuation of the species. In plant life the movement of pollen from the male to the female flower causes the latter to become fertilized, resulting in the formation of fruit or seed. There are several agents employed in the movement of the pollen, such as wind, water, birds and insects, but by far the most important is the honeybee.

Pollen is essential to the honeybees because it is an important part of their food. It is necessary for bees to have a balanced diet and pollen is practically the only source of protein available to them. There are localities in Florida where bees cannot get pollen during certain months. Although they may have plen-

ty of honey, in such cases they will stop rearing young and will slowly decrease in number. Many colonies die out completely unless the beekeeper moves them to a location where they can gather pollen.

The nectar evaporators take the nectar brought in by the field bees into their own honey sacs. They force it out in droplets onto their tongues, hold it there a few seconds, and then draw it in again. They repeat this for some time. While doing this they mix secretions (enzymes) of the glands with the nectar. These start a process called inversion, which consists in changing cane sugar into grape sugar. When the mixture is of the right consistency the bees deposit a little in each cell, spreading it out over a comparatively large area so that the water will evaporate rapidly. Sometimes, in order to hasten evaporation, they deposit nectar droplets in various places on the combs. They really hang it up to dry.

The field bees are classed as nectar gatherers, pollen gatherers, propolis gatherers and water carriers.

The nectar gatherers are those that go out in the field to sip the nectar from nectar secreting flowers. Upon filling their honey sacs they return and deliver their loads to the bees in the hive. A bee with a load of nectar dances around in small circles on the comb until she attracts the attention of the other bees. As soon as they notice her several start out into the field looking for the place where she found her load. It is an accepted fact that they are guided in their search by the odor the bee leaves as she gathers nectar.

They may find her source of income a short distance from the hive, or perhaps two or three miles or more away. The extent of the honeybee's flight is generally spoken of as being two or three miles, but this depends greatly upon the location. Bees have been known to travel seven and eight miles from their hive to gather nectar. This occurred when they found linden or basswood blooming at the foot of a mountain and followed it gradually up the side. In a prairie country where the bees have a clear, open flight they travel much farther than in a timbered country. In most localities in Florida the extent of their flight is probably two or three miles.

Of course it is more profitable to the beekeeper to have his bees located as near the source of nectar as possible. It is advisable to place them in the center of a circle having a radius of two or three miles. The farther the bee has to travel to gather

the nectar the shorter will be her life; her wings will wear out and she will die.

The question is often asked: How many trips does a bee have to make in order to gather one pound of honey? No one bee ever made a pound of honey; its life is too short. Some writers have said that under the most favorable conditions, one bee, during its entire life, might gather enough nectar to make one half ounce of honey. In order for a bee to gather one pound of honey it would have to travel a distance equalling four times the circumference of the earth. This will give some idea of what a pound of honey costs the bee colony.

The worker bees are equipped with two pollen baskets, one on each hind leg. The pollen gathering bee gets the pollen from the flowers and packs it into these baskets. Upon returning to the hive this bee also goes through a dance. This dance differs from the round dance of the nectar gatherer. It has been called the "tail-wagging" dance because the bee wags her tail continuously while dancing. When she is satisfied with the attention that she has attracted, she deposits her load of pollen in a cell, which may either be empty or have some pollen in it. Having deposited her load of pollen, she departs and other bees pack in the cell.

A nectar gathering bee usually visits the same variety of flower during each trip; that is, if she starts out by visiting an orange bloom she will continue to visit orange blooms on that trip. As a rule a bee, while gathering pollen, visits only flowers of a single variety on each individual trip. The fact that the honeybee does this while gathering nectar or pollen is one reason why it is the greatest known agent in the pollination of fruits and vegetables. It has been said by students of pollination that the honeybee is twenty times more valuable as a pollinator than as a producer of honey.

The bee gathering propolis also carries it in the pollen baskets. "Propolis is a brownish, resinous material, of waxy consistency, collected by bees from the buds of trees and used as a cement." In Florida a large part of the propolis is gathered from the sweet gum and pine trees. The writer has caught bees coming in with loads of clear pitch; at least, it looked and tasted like pitch. This is given to the painters and varnishers in the hive. Propolis is used furthermore by surgeons as a basis of an important antiseptic. It is highly recommended as a domestic remedy for wounds and burns and also makes an excellent polish for wood and leather.

The water carriers carry the water in their honey sacs. On warm days they may be seen sucking water from the moist earth around the edges of lakes and ponds or along streams. Often they work around pumps or water faucets. It is advisable for the beekeeper to place a water fount in the apiary so that the bees will not bother his neighbor's pump. When the bees are gathering a great deal of nectar, very few are observed carrying water. This is due to the fact that nectar is about eighty per cent water. The bees use a great deal of water when they are rearing much brood. Either the brood demands large quantities of water or it takes more water to lower the temperature of the hive, which rises during brood rearing. By scattering the water in small drops and by creating a strong current of air to circulate through the hive the temperature is lowered by evaporation. Frequently small drops of water may be seen in irregular depressions of wax on the tops of the frames.

The outcome of this cooperation is "nature's own sweet"—honey. Honey is the only concentrated sweet found in nature. We have sap from the maple, juice of sugar cane and other sweets, but they must first be processed before we get the finished product. The foremost authorities on food and dietetics say that this process removes the vitamines and mineral salts so essential in a well balanced food. As honey contains these mineral salts and vitamines, it is the most healthful sweet known to man.

There are honeys with as many different flavors as flowers that secrete nectar. In other words, from the nectar that the bees gather from the orange they produce orange honey; from palmetto, palmetto honey. These honeys differ in flavor, color and density. All honeys are good, but some people prefer one flavor, some another.

The story has been told that when bees gather nectar from certain flowers the honey is poisonous to the person who eats it. This is untrue. If the honeybee does gather nectar that is poisonous, she will die before she can return to the hive. This has been proved many times. In Colorado the spray used on apple orchards sometimes falls on the clover which is blooming under the trees. The bees, in gathering the nectar from the clover, gather some of the poison spray and die before returning to the hive. The writer has seen millions of bees that had died from this cause; but no poison spray was ever found in the hive.

Soil properties influence the color and the amount of honey. A flower or plant may secrete nectar in one location while in another, possibly a few miles distant, it will not secrete any; or, if it does, only in small quantities. Bees produce different colored honey from plants of the same kind in different localities. For instance, they may produce a light amber honey from the partridge pea in one location, and in another a dark amber.

There are a very large number of flowers and plants that secrete nectar in small quantities, but comparatively few that secrete it in sufficient amounts to enable the bees to store a surplus of honey. Here are the names of a few of the flowers and plants that secrete the nectar from which bees produce the best honeys in Florida: tupelo, orange, gallberry, saw palmetto, scrub palmetto, cabbage palm, partridge pea, mangrove, sunflower, ty ty, goldenrod, summer farewell, holly and Jamaica dogwood. These are all good table honeys. In color they range from water white to amber. Some are thick in body, others thin, but all have a good flavor and sell well. There are a few plants in Florida that secrete nectar from which the bees produce dark, off-grade honeys. Two of these are chinquapin and andromeda. Chinquapin is a common shrub of West Florida, the honey of which is dark and of a strong flavor. Andromeda is a shrub resembling the gallberry which grows on low, sandy lands. The honeys from chinquapin and andromeda are dark and have a bitter taste. These honeys are used by the beekeepers in feeding their bees and are also sold to bakers.

RESOLUTIONS ADOPTED BY THE BOARD OF CONTROL FEBRUARY 13, 1928

WHEREAS, Doctor Owen F. Burger, Plant Pathologist of the University of Florida, Experiment Stations, and of the State Plant Board, passed away January 26, 1928, as a result of injuries sustained in an automobile accident near Sebastian, Florida, January 23rd, and

WHEREAS, Doctor Burger was active in Church work and civic affairs, a deep scholar, a skilled and experienced investigator, nationally known as a leader in his profession, and during his eight years in the employment of these Boards had devoted himself unreservedly and successfully to the investigation of Florida plant diseases and methods for their prevention and control, and

WHEREAS, the University of Florida, the Experiment Stations, the State Plant Board and the agricultural industries of Florida have sustained an irreparable loss through his death,

THEREFORE BE IT RESOLVED, That the Board of Control of the State of Florida hereby expresses its deep sense of the great loss sustained in his death, and

BE IT FURTHER RESOLVED, That we deeply sympathize with his loyal and loving wife, Mrs. Helen L. Burger, and the other members of his family in their great bereavement; that a copy of these resolutions be sent to them, a copy to the Faculty of the University of Florida, a copy to the staff of the State Plant Board, and a copy given to the Press; also that a page of our Minute Book be set apart as a token of respect to his memory and as a recognition of his loyal service and valuable accomplishments.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

WILMON NEWELL, *Plant Commissioner*............*Editor*

ASSOCIATE EDITORS

E. W. BERGER............*Entomologist*
J. C. GOODWIN............*Nursery Inspector*
J. H. MONTGOMERY............*Quarantine Inspector*
............*Plant Pathologist*

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

Owen F. Burger

DIED AT WEST PALM BEACH, JANUARY 26, 1928, OWEN F. BURGER, PLANT PATHOLOGIST OF THE AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF FLORIDA, AND OF THE STATE PLANT BOARD OF FLORIDA.

An appreciation of Doctor Burger's life and work, prepared by his close associate and coworker, Doctor George F. Weber, and published in the February issue of "The Florida Alumnus," is presented herein. The word "irreparable" may most properly be applied in considering the loss to the University, the state and the nation occasioned by the death of this eminent scientist and real man.

OWEN F. BURGER—MAN AND SCIENTIST

By GEO. F. WEBER*

Owen Francis Burger, plant pathologist of the Florida Agricultural Experiment Station and State Plant Board since 1920, died January 26, 1928, in the Good Samaritan Hospital at West Palm Beach, from injuries received in an automobile collision Monday evening, January 23.

He was born at Freeland, Pennsylvania, June 8, 1885, he being the youngest of a large family. And at an early age, he was left fatherless. He was married July 22, 1916, to Helen Sanborn Lothrop of Boston, Mass., who survives him.

OWEN FRANCIS BURGER

During his boyhood days he attended the school at Noblesville, Ind., where he graduated from high school in 1904. During the following year he worked in order to enter the University of Indiana in the fall of 1905. In 1909 he received an A.B. degree from that institution, majoring in the botanical sciences. He was selected as an assistant to the plant pathologist of the Florida Experiment Station, where he took up his duties after graduation. He pursued graduate work in the University of Florida while working as an assistant and received an M.S. from the University in 1911. His liking for the natural sciences, especially botany, was encouraged by his professors at the University of Indiana.

While at the Florida Experiment Station, he was assisting Dr. H. S. Fawcett and from him undoubtedly received

*Associate Pathologist, Agricultural Experiment Station, University of Florida.

his inspiration and desire to make mycology and plant pathology his life work. At this time in Dr. Burger's career there developed the desire to serve that was so profoundly manifest in later years.

After receiving his M.S. degree he was made assistant plant pathologist of the Florida Experiment Station. He held this position for two years, leaving in the fall of 1913 in order to pursue graduate work at Harvard University. During 1913-14 he was a University scholar at Harvard and during the following two years was a Priscilla Clark Hodges scholar in the same institution. He was granted an M.S. degree from Harvard in 1915 and a D.Sc. in June, 1916.

Early Contact With Big Minds

His principal contact from a professional viewpoint while at Harvard was with Drs. Roland Thaxter and E. M. East. He was appointed instructor in plant pathology at the Citrus Experiment Station, University of California, in 1916, where he remained until 1918, when he was made a pathologist in the United States Department of Agriculture. In this capacity he investigated the causes for losses of fruits and vegetables in transit from the field and grove to the large central markets of the country. In December, 1920, he was made plant pathologist of the Florida Experiment Station in which capacity he was acting up to the time of his death.

Dr. Burger readily qualified in that honorable group known as self-made men. His early education was obtained through an unrelenting struggle. He earned his way as he went, through college and during his graduate work.

While in college he was popular and was one of the "gang" that was often suspected in indulging in college pranks. He met all comers man to man and his six foot one height and more than two hundred pounds weight made him an adversary to be considered.

"Why Should He Be Taken?"

His home life was most pleasant. He was a loyal, thoughtful and devoted husband. His wife was his best companion. They lived for each other, she being at his bedside when he

passed to the great beyond. As a man Dr. Burger measured up in full. It is to be regretted that one so big-hearted and lovable could not be spared.

Dr. Burger was a devout Christian. In his early life he regularly attended services and was especially interested in young peoples' organizations. He was a member of the Episcopal Church.

In one of his books on religion there are certain passages which he marked with distinct marginal notes. "God is love;" "The Kingdom of Heaven is within you;" "Religion is what the individual does with his own solitariness;" and "Straight is the gate and narrow is the way. . . . and few there be that find it." By a paragraph discrediting appeals to mob psychology in herding people into churches he wrote "This fits my view better than anything I have ever read." Those of us who were so fortunate as to know that part of his nature, remember with pleasure the tilt of his chin and the half-smile on his lips as he sat and unfolded his beautiful ideas about his relationship to his God and his fellow men.

As a Bible class teacher Dr. Burger's methods were most interesting. Tactfully and skillfully he drew forth people's opinions so that by careful directing he had the members of the class do most of the talking and forming of ideas. The class seemed to be teaching itself, but the members knew that the dynamic personality of the teacher was responsible for successes gained.

No fears need be felt in commending Owen Francis Burger to God's gracious keeping.

Gave Much to Our Agriculture

Dr. Burger will be remembered by the majority of Florida people for what he did to improve agriculture in this state. His basic education was broad and liberally grounded in the arts and sciences. Practical work in the field and laboratory, conducted parallel with his graduate studies, acquainted him with the problems of the man of the soil. His most important work was with the citrus growers. He conducted experiments on blue mold decay and stem-end rot of citrus.

Considerable of his efforts in the past few years were devoted to improving existing methods of disease control. He took great interest in the functioning of the State Plant Board in reference to plant disease control. He cooperated in formulating and putting into effect state and federal quarantine rules and regulations. He assisted in acquainting railroad employees with the types and amount of disease occurring in transit. Sectional meetings in the state, held for the purpose of conveying recent information from the laboratory directly to the grower, usually found him a principal speaker on the program. His fund of knowledge and his dynamic personality were his outstanding qualities as a teacher and platform speaker. He traveled extensively in the state, visiting farms, groves and packing houses.

Built up Great Department

He was alone in the Department of Plant Pathology when he assumed his duties in 1920. It was not long, however, until he was convinced that the progress to be made was so great and the various problems so numerous that he must have aid. In surrounding himself with assistants he demonstrated his broad vision by selecting men, fully prepared to conduct research work. He desired men who were mature, even though inexperienced. He selected them from the numerous larger institutions, where the leaders in plant pathology were located.

At the time of his death his staff consisted of 12 trained men scattered over the state located in the sections where they were most needed, all doing more or less individual research work toward a common end, namely the assistance of the producer and consumer. He has developed a large department into a smoothly functioning unit, demonstrating his leadership and ability as an organizer. His ideas of service and his regard for the truth have been instilled into every one of his assistants. His breadth of vision, personality, sense of duty and ambition are four reasons for his success. His ability as a scientist was equaled or possibly surpassed by qualities of leadership and organization which were contributing so largely to his success as a director of numerous activities under his supervision.

Member of Many Honored Societies

The preliminary work of selection of personnel and the organization of the projects in plant pathology were almost completed by Dr. Burger. The periods of anxiety and doubtfulness were past. He was beginning to see the end of the formative period and about to enter into the productive field. He was taken from his desk when the load was beginning to lighten. Under ordinary circumstances he would have enjoyed a score of years of productive work in the state with due recognition from the nation.

Dr. Burger was a fellow of the American Association for the Advancement of Science, and a member of the following: American Phytopathological Society, Botanical Society of America, American Agricultural History Society, Florida Entomological Society, British Mycological Society, Florida Horticultural Society, New England Botanical Club, Phi Kappa Phi (local treasurer), Sigma Xi (local vice-president), the Masonic Order, and Kiwanis Club.

He wrote many bulletins and papers and collaborated in many others, and he was a recognized authority within his chosen field.

THE MONTHLY BULLETIN
State Plant Board of Florida

DEPARTMENT REPORTS

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S MONTHLY SUMMARY
JANUARY, 1928

SHIPS AND VESSELS INSPECTED:			
From Foreign Ports:			
Direct	264		
Via U. S. Ports	53		
Total		317	
From U. S. Ports other than Florida		192	
From Florida Ports		79	
Total			558
NUMBER OF PARCELS INSPECTED:			
Arriving by water:			
Passed		111,689	
Treated and passed		19,043	
Returned to shipper		514	
Contraband destroyed		410	
Total			131,656
Arriving by land—express, freight, wagon, etc.:			
Passed		560	
Treated and passed		686	
Returned to shipper		5	
Contraband destroyed		7	
Total			1,258
Arriving by mail:			
Passed		154	
Treated and passed		0	
Returned to shipper		1	
Contraband destroyed		1	
Total			156
GRAND TOTAL OF PARCELS INSPECTED			133,070
Number of parcels on hand pending determination as to final disposition			2

NURSERY INSPECTION DEPARTMENT

NURSERY INSPECTOR'S SUMMARY FOR MONTH OF JANUARY, 1928

Number of nurseries inspected		1,036
Quantity of stock inspected:		
Citrus	6,696,283	
Non-Citrus	9,586,611	
Total		16,282,894

DEPARTMENT OF CITRUS CANKER ERADICATION

REPORT ON ERADICATION WORK IN COOPERATION WITH THE BUREAU OF PLANT INDUSTRY, UNITED STATES DEPARTMENT OF AGRICULTURE, FOR MONTH OF JANUARY, 1928

Citrus grove trees inspected	1,303,148
Citrus nursery trees inspected	0
Inspectors employed on citrus canker eradication	33
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

GENERAL SUMMARY

Florida counties in which canker has been found	25
Grove trees found infected since May, 1914	15,243
Nursery trees found infected since May, 1914	342,260
Number properties found infected to January 31, 1928	515
Properties declared no longer danger centers	512
Properties still classed as actively infected January 31, 1928	3

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to January 31, 1928:

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Tot'l
1914	....	....	....	....	108	160	275	1313	767	565	773	366	4327
1915	306	165	444	408	1042	772	651	1345	618	214	494	256	6715
1916	86	21	49	49	338	450	349	219	124	451	131	27	2294
1917	14	4	9	169	52	45	39	30	6	2	1	1	372
1918	0	1	1	2	1	10	0	0	0	0	0	0	15
1919	0	0	1	1	1	0	0	1	0	0	0	0	4
1920	0	0	0	0	0	0	539	1	0	0	0	0	540
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	585	168	28	34	23	19	12	4	873
1923	1	1	2	3	2	1	0	0	0	1	0	0	11
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	5	0	0	0	0	0	0	0	0	0	5
1926	0	0	0	0	0	0	0	0	0	0	0	2	2
1927	0	0	0	0	0	0	0	0	0	0	85	0	85
1928	0	....	....	....	....	....	....	....	....	....	....	....	....

BEE DISEASE ERADICATION

REPORT FOR MONTH OF JANUARY, 1928

Number of apiaries inspected	9
Number of colonies inspected	113
Number of apiaries infected with American foul brood	1
Number of colonies infected with American foul brood	1
Number of colonies destroyed	1
Number of apiaries infected with European foul brood	0
Number of colonies infected with European foul brood	0
Number of colonies destroyed	0

SUMMARY FOR PERIOD JULY 1, 1927 TO JANUARY 31, 1928

Number of apiaries inspected	887
Number of colonies inspected	12,977
Number of apiaries infected with American foul brood	15
Number of colonies infected with American foul brood	25
Number of colonies destroyed	25
Number of apiaries infected with European foul brood	1
Number of colonies infected with European foul brood	1
Number of colonies destroyed	1

THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII March, 1928 No. 9

---AND THE JAPANESE BEETLE GOES MARCHING ON

By J H Montgomery

In the summer of 1916 a few little green "bugs", beautiful in appearance and rapacious in their feeding habits, were found in certain plantings near Riverton, New Jersey. It was noted that these beautiful little beetles were not at all "choosy" in selecting their food material; indeed, they were just the reverse, and although some fruits, vegetables and plants appeared to be preferred, yet almost all plant material was subject to attack. Investigation disclosed the identity of the insect: It was recognized as *Popillia japonica* Newm., an oriental species. On account of the fact that the pest had been introduced into the Riverton area on plants from Japan, it was given the common name "Japanese Beetle".

When the presence of the beetle was brought to the attention of the State and Federal agricultural departments, its identity determined and its potential menace as a pest recognized, a conference of specialists was called at Riverton and the whole situation canvassed. At that time the entire area involved was only half a square mile. Some of the state officials, including Plant Commissioner Newell of Florida, advocated a drastic course of procedure in an effort to stamp out—eradicate—the pest immediately. They believed that, considering the wide range of host plants, the voracious and omnivorous feeding habits of the beetle, the relative ease with which it would spread, and the resulting economic loss, such an effort, even though it involved the expenditure of large sums, was justified. However, this course was not followed. A temporizing policy was adopted involving (a) imposition of a restrictive quarantine; that is, shipment of plants and plant products from the infested area under inspection and certification; (b) a study of the biology and habits of the insect; and (c) an investigation to determine or develop methods of control, both natural and artificial.

Plant Commissioner Newell, upon his return from the River-

ton conference, reported to the State Plant Board on the situation and recommended that the Board inaugurate measures to prevent the entry into Florida of all dangerous material from the infested area in New Jersey and such additional areas as might later be found to be infested. The Board adopted such a rule. The Florida public was advised of the situation and prospective users of plants were strongly urged to secure plants from places other than the Riverton section of New Jersey. Since that time the position of the State Plant Board has not been changed. From time to time articles have been published, talks have been delivered, and by correspondence and otherwise we have endeavored to discourage the shipment of Japanese Beetle-dangerous material into Florida, much to the dissatisfaction of the large nursery interests in the infested area.

All during the time since the discovery of the beetle at Riverton, New Jersey, and despite the efforts of both Federal and affected State agencies participating in the quarantine, the beetle has continued to march on, until now all of New Jersey, the eastern half of Pennsylvania, parts of Maryland, New York, Connecticut, Delaware and the District of Columbia are included in the infested area; **AND THE JAPANESE BEETLE GOES MARCHING ON.** It apparently is only a question of time until still larger areas will be invaded and ultimately the Japanese Beetle will reach and go **MARCHING THROUGH FLORIDA.**

It is not impossible that before the beetle invades our state efficient practical and economical control measures will have been perfected. They haven't been yet. Therefore it is the duty of citizens and officials to put off the evil day as long as possible. It is with this thought in mind that we are publishing in this issue of the Monthly Bulletin an article, "The Japanese Beetle is Spreading", which was printed in the February, 1928, issue of the "American Fruit Grower Magazine". This article is by Mr. Amos Kirby, a staff writer of the magazine, and is based on personal investigation and observation, as well as published official reports. The dire predictions made by some of those who attended the 1916 Riverton Conference, it would seem, have been fully borne out. The criticism and abuse which the State Plant Board of Florida has received from some sources on account of its efforts to prevent the introduction of the Japanese Beetle into Florida appear not to have been justified or warranted. On the contrary, our position has been vindicated.

In this issue of our journal we are re-publishing a report of an address by J. R. Springer, Assistant Nursery Inspector of the State Plant Board, delivered before assembled citrus growers at the annual Farmers' and Fruit Growers' Week, in August, 1926. This address was published in the Bulletin of the State Plant Board, issue of October, 1926, and occasioned no little comment, not only at the time of its delivery but after publication. The talk of Mr. Springer followed a personal investigation by him in New Jersey in the summer of 1926. The Kirby article in the "American Fruit Grower Magazine" is in line with Mr. Springer's observations and his conclusions are borne out by Mr. Kirby.

In this issue is published a copy of a letter which is sent out from the office of our Nursery Inspector to the receivers of plants shipped from the beetle infested areas. The purpose and object of this letter, it will be observed, is to safeguard such shipments as much as possible. In this connection, we would direct the attention of Florida readers to the fact that these shipments are being made into Florida because the Florida authorities are powerless to prevent them. They are coming in over our protest and contrary to our desires. The original rule of the State Plant Board *prohibited* such shipments. Subsequently it was found that, on account of the Federal Horticultural Board regulation permitting plant shipments to be made from the affected areas when properly certified, state rules could not exclude such shipments. Therefore, arrangements were made that our organization be informed of shipments made to Florida under Federal certification and we, in turn, then communicate with the receiver as per the copy of the Nursery Inspector's letter which is herein reproduced.

We urge our readers to carefully read the material herein presented: (a) the Kirby article; (b) the Springer article; (c) the letter to plant receivers; and to cooperate to the limit with our organization in our efforts to prevent the early introduction of the Japanese Beetle into Florida.

THE JAPANESE BEETLE IS SPREADING[1]

BY AMOS KIRBY[2]

The Japanese Beetle is headed for the southland. Fourteen months ago it had crossed the Mason and Dixon line. Last winter it had reached Baltimore; early the past summer it had passed Washington, and by now it probably has gone into winter quarters on the edge of the cotton belt.

Just as various members of the family of this restless pest have tramped over the Orient from Siberia to Java, so apparently it is planning to romp over all the American continent. It is only a matter of 11 years since the Japanese beetle was first found near Riverton, N. J. At that time, it had spread over a half of a square mile, while today 14,000 square miles are under quarantine, and the beetle has been found in some sections of seven states.

During this brief stay, it has clearly demonstrated what a serious pest it can become if allowed a free hand for a very long period. The injury to early apples and peaches amounts to 100 per cent of the crop if no control measures are taken. This has been clearly demonstrated in New Jersey during the summer of 1927, where abandoned fruit orchards have been swept clean by the beetle and where no spraying operations have been carried on for two years. Following a real estate boom of two years ago, scores of orchards are now without owners, and the rapid development of the pest in these neglected farms presents a new hazard in beetle control work.

FEEDS ON MANY PLANTS

The wide range of favored foods of the beetle also presents another serious problem for its ultimate control. There are about 200 different plants, trees, shrubs and farm crops in New Jersey that are attacked by the beetles if no protection is offered. It is proving far more serious than most other pests that attack farm crops and fruit. While the codling moth is a serious pest of the apple, the beetle attacks scores of plants with an equal viciousness.

The biggest factor in the restriction of the beetle has been the

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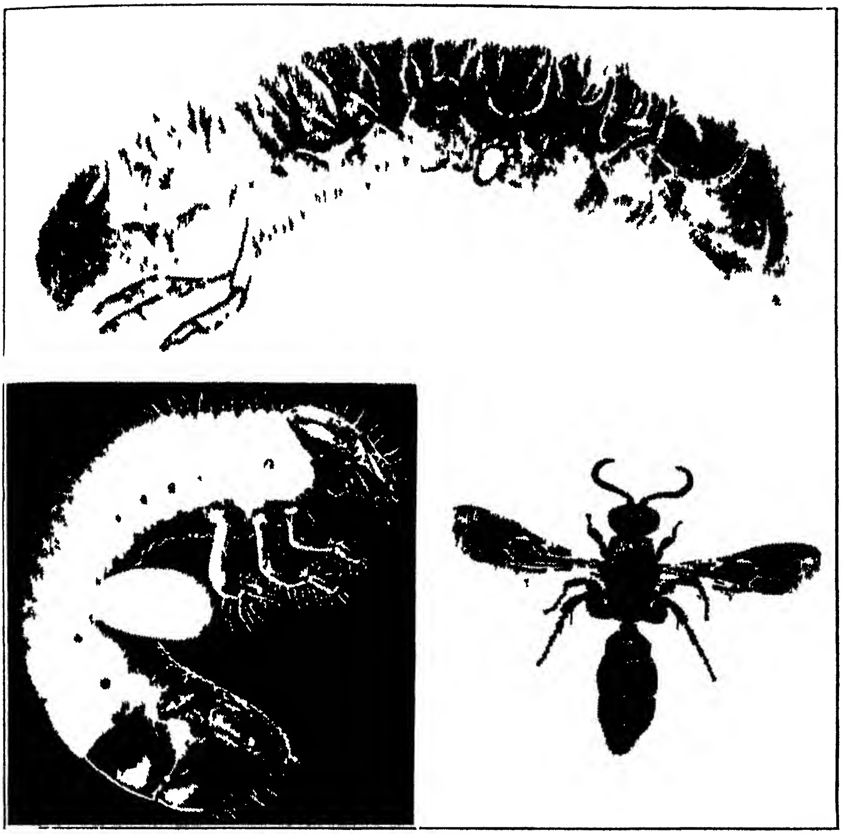
Staff writer, American Fruit Grower Magazine.



Above.—Enlarged picture of Japanese beetle grub with egg of Tiphia (a parasite) attached on the under side. Lower left.—Enlarged picture of grub with Tiphia egg after growth. Lower right.—Adult of Tiphia.

establishment of a strict quarantine on the movement of all fruit and vegetables that are its favored food. There has at the same time been maintained an equally close watch on other articles of food that have the least chance of offering a hiding place or a means of spreading the beetle into uninfested regions. The quarantine has been carried to the point where inspection service is maintained in many of the large distributing centers where the beetles may have been brought in the market. The states of Delaware, Pennsylvania, New Jersey, New York and Connecticut are all contributing money to maintain this service.

Even this has not kept the beetle within bounds. Despite the close watch on every package of fruit or vegetable going outside of the territory, the beetle has continued to spread. The

quarantine lines have been extended from year to year until today 14,000 square miles are included under the supervision of the beetle inspectors. In this area is included the entire state of New Jersey, northern part of Delaware, eastern part of Pennsylvania as far west as Harrisburg, New York City, lower New York state, sections of Long Island and two towns in Connecticut. The year 1927 saw a doubling of the area over the previous year, when less than 7000 square miles were watched.

Beetles Have Continued to Spread

In spite of this strict quarantine enforcement, the beetles have continued to spread. Neither can the blame be placed on the officials in charge of the inspection, nor can it be claimed that the beetles have been spread through the movement of either fruit or vegetables. This line of spread has been carefully checked. Inspection at destination of cars loaded in the beetle territory and certified as free from beetles has failed to disclose a single instance where beetles have been carried in this manner.

The tourist automobile and the railroad, particularly passenger coaches and cars of miscellaneous freight, have undoubtedly played a leading role in its spread. The recovery of beetles 100 or more miles from the heavily infested area and the finding of 200 beetles in a car of farm machinery at Harrisburg, Pa., is evidence that the beetle is spreading by other means than the transportation of fruit and vegetables.

To meet the situation of controlling the spread of the Japanese beetle, there has for 10 years been maintained at Riverton, N. J., a research laboratory, where every phase of the problem has been studied. Started in 1919 by a small appropriation from the United States Department of Agriculture, it has gradually been enlarged and its scope of activities increased to meet the situation as it grew in seriousness. As the beetle spread, the several states affected have contributed to the maintenance of the laboratory and the quarantine work.

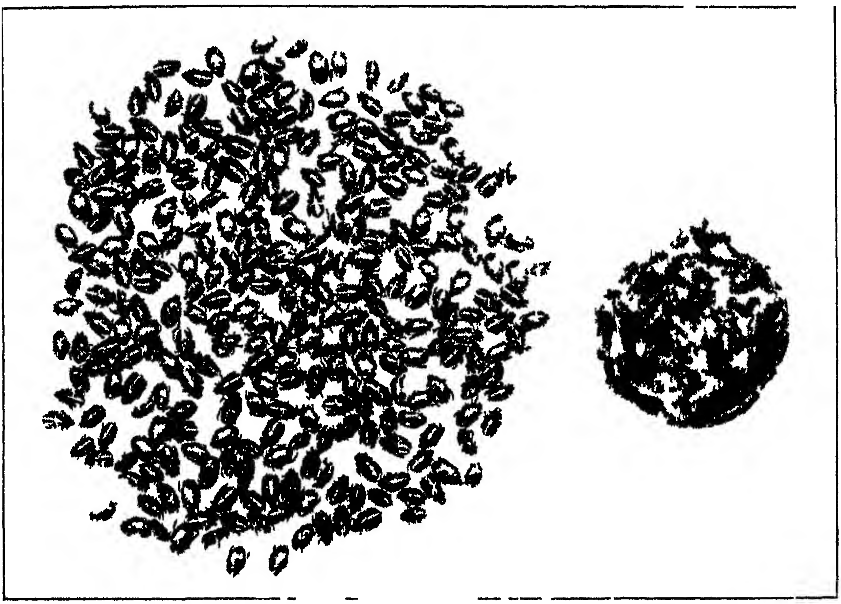
Control Methods Developed

Despite the rapid spread of the beetle and the serious injury that it is causing, satisfactory control measures have been worked out. It is doubtful if any other pest in recent years has a more complete array of means developed for his downfall than now confronts the beetle. The entomologists have developed

every line of attack that is practical, and last year's results in the field under varying conditions prove that they are on the right track for control.

Three lines of control have been found effective: the spraying of trees and shrubbery; the introduction of parasites, and the development of traps. Greater strides have been made during the past six months in developing a control than in any similar period since the pest became serious.

Fruit growers are now able, even in the heart of the most heavily infested sections, to get as much as 90 per cent protection on foliage and 95 per cent freedom from injury on the fruit. This is in direct contrast with orchards separated by only a line fence where the trees are 90 per cent defoliated and the fruit all ruined.



These beetles were all found on the remains of one apple

Grape growers are having a similar experience. One large vineyard turned over to the entomologists last spring showed 90 per cent protection, compared with 90 per cent injury where not protected, even though millions of beetles were found in the vicinity. Arsenate of lead has been the basis of all the control work on fruit trees. The growers, by changing their regular spray program, have been able to get a control on the beetle.

The secret lies in more careful application and a slight modification of the applications and the poison content.

So successful has the control by spraying worked out that Moorestown, N. J., a community of several thousand inhabitants, put on a spray program for the community that saved every tree from injury. The new lead oleate coated arsenate of lead was used in the town, because it is more effective as a beetle control, while acid arsenate of lead was used on the fruit trees because the growers feared the residue of lead when it came to marketing the crop. The lead oleate coated arsenate of lead sticks much longer than ordinary arsenate of lead. It will stay on the foliage for an entire season, and the hot sun of July and August and the accompanying rains do not remove it from the tree.

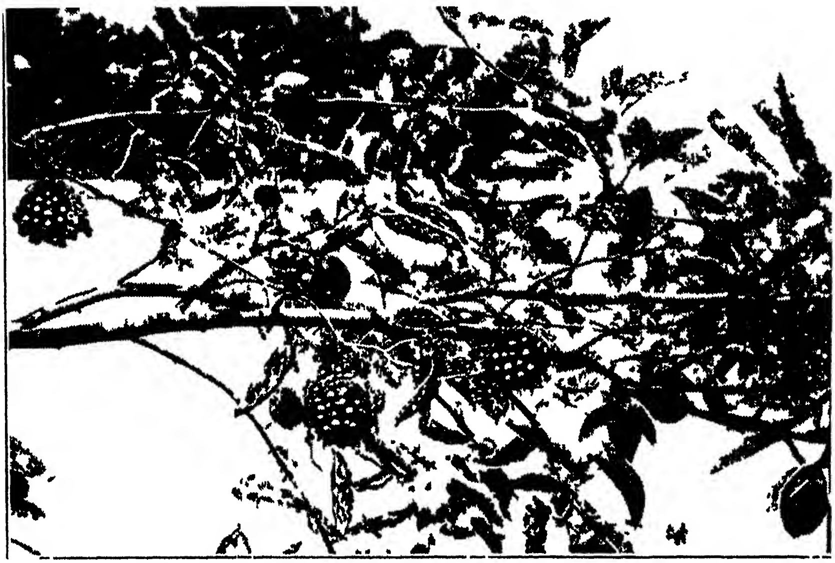
Another feature of the spray program that offers promise as an effective control measure is the geraniol-pyrethrum soap contact spray. While still in the experimental stage and advisable for communities only, it shows the way to kill beetles in huge numbers. The beetles are attracted to a tree or a particular location by the application of geraniol. It takes only a very few minutes to draw thousands of beetles to a central location. When the beetles have congregated on the tree or bush, the pyrethrum soap contact spray is turned on the unsuspecting victims. The pyrethrum paralyzes the beetles, the soap clogs their breathing pores, shutting off their air supply, and they die in a few minutes from suffocation. There are some new developments with this potent material that may result in a startling method of control in the near future.

Parasites Appear Promising

No discussion of the beetle is complete without the parasite. Located in the Orient, transported to New Jersey, acclimated in the laboratory, liberated in the field, it is now one of the most active and positive methods of control yet devised for checking the spread. Already it covers 70 square miles in the most heavily infested regions, and the beetle hosts are decreasing where the parasite is the most numerous. This tiny fellow—so active, yet so rarely seen—is doing a bigger piece of work than most people realize. So far, five species of the parasite have become firmly established, and they can be recovered in widely separated sections of the area.

Care has been taken in liberating the parasites. They have

been placed in localities where the infestation has been quite serious, and as a result of these colonies, the beetles are disappearing in numbers. It may be just a coincidence, but accurate counts kept on the beetles in these localities show that for the past three years they have been decreasing. Two types of parasites have been introduced. One species attacks the tiny grubs while in the ground, and another one attacks the adult beetle while it is active and doing the most injury. All are active, appear to be adapted to New Jersey conditions and apparently are multiplying quite rapidly.



Japanese beetles like fruit as well as foliage. Approximately 1500 beetles were found on this small branch

Millions Caught in Traps

Another line of attack, developed during the past two years, has proved particularly valuable and has resulted in the capture of millions of beetles. An ingenious trap for catching them was developed in 1925 at the laboratory which promises to be a valuable aid in control. Baited with a geraniol preparation, the beetles are attracted to the trap and enter by the thousands. Instances are known in which 10,000 have been caught in a day, and as many as 100,000 in a season. The traps are now being used by the hundreds. However, the trap is not recommended unless used as a supplementary measure in connection

with one of the spray programs. It has been found that geraniol, if not used with discretion, may act as a boomerang and draw more beetles to a given locality than will be caught in the trap. If the foliage on the trees is not sprayed, the hordes of beetles will not all find the trap, and they will alight on the trees and destroy the foliage. If the tree is sprayed before placing the trap, a large kill of beetles will be secured, and the trap will be able to catch a large number of the remaining beetles. It has been found by actual count that 75 per cent of the beetles entering a tree that has been thoroughly sprayed will die from the poison they have taken. The results from the lead oleate coated arsenate of lead run as high as 85 per cent kill.

SUMMARY

Thus, with the varied line of attack the entomologists have built up against the beetle, the extent of the foliage injury is being minimized. All of these control measures have proved effective in controlling the beetle, besides being practical for the individual or the community, and can be performed at a price that is within the reach of everyone.

The sprays are practical; the traps are aiding, and the parasites are doing a big piece of work, with the result that the beetle numbers are gradually decreasing in certain localities where a real fight has been staged. While the beetle has been having a harder time year after year in a restricted area near Riverton, it has turned its attention to other points where the food is not covered with poisons and the ground filled with parasites. Its ramblings in other parts of the country present a problem that the future alone can solve.

THE JAPANESE BEETLE

(Address delivered by J. R. Springer before the Citrus Section, Farmers' and Fruit Growers' Week, August, 1926)

There is present, right now, in the United States a menace to agriculture which is almost as great a scourge as that of the locusts mentioned in the Bible. This pest, known as the Japanese Beetle, is firmly established in New Jersey, Pennsylvania and Delaware. Through the courtesy of Mr. Loren B. Smith, Entomologist in charge of the Japanese Beetle Project under the direction of the United States government at Riverton, New Jersey, I was given an exceptional opportunity this summer for studying the situation as it now exists in New Jersey. It is my object to make this discussion as non-technical as possible, but still impress upon you the dangers attending the possible introduction of this insect into Florida.

The beetle was introduced into the United States prior to 1916, but it was not discovered until that date. It probably came in soil around the roots of iris plants which were imported into the Riverton section by one of the large nurseries there. It was no doubt introduced in the larval or grub stage. Both of the speakers who preceded me had pictures with which to illustrate their subject matter and, not to be outdone, I have brought some Riker mounts which show the insect itself and the injury which it does to the foliage of plants.

The life cycle of the Japanese Beetle in New Jersey covers a period of about one year, twelve months. Nine months of this time is spent in the soil as a grub, shown in the little vial in the Riker mount. During these nine months, except for a short period of dormancy in cold weather, it is feeding on the roots of grasses and various kinds of plants. During the three months when the adult emerges from the soil and is on the wing flying actively, it attacks the foliage and fruit of practically all vegetation in New Jersey, and I presume if it were introduced into Florida it would attack everything here. The number of host plants, as I have just indicated, is enormous. I am informed that over two hundred different plants which it attacks have now been actually counted. The adult beetle feeds on the foliage and fruit and gathers there in immense numbers. The damage to the foliage has a skeletonizing effect. All of the tissue between the veins is eaten out and then the plant, having no leaf

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Assistant Nursery Inspector.

surface to elaborate its plant food, gradually dwindles and in the course of a few years dies. Annual plants die down right away and never come up again.

The rapidity of increase and spread of this beetle since its introduction defies description. In 1916, when it was first discovered, the inspectors of the State of New Jersey found only twelve beetles, and these twelve beetles were collected in an area of less than one-half square mile. The following year, 1917, 2.7 square miles were found to be infested and several thousand beetles were collected. In 1918 the infested area had increased to 6.7 square miles; in 1919 to 48.3 square miles; and there were myriads of beetles in the centers of the severely infested areas. By the end of the season of 1925, the infested area had increased to 6,047 square miles and the numbers of beetles in the middle of this severely infested area were uncountable. They were there in countless millions, and I presume that I could say countless billions and still be conservative in my estimate.

I have here a map published by the Quarantine Department of the Japanese Beetle Project, which shows the present distribution of this beetle in the United States. Through the courtesy of Mr. Smith, who had it colored for me, I can show the severity of the infestation in the different parts of the whole infested area. This whole section colored light green is within the quarantined area and is the part that includes the 6,047 square miles. However, the part in purple, which is in the center, is an area approximately twenty miles in diameter in all directions and is the intensely infested area. In that area the beetles are present in swarms. In the area in yellow, if an inspector could go out and devote his entire day to collecting beetles, he could probably collect from five to ten thousand without any trouble. Out in this brownish area the number would probably be reduced to a thousand, while down here there may be only a few hundred, and so on into the quarantined green area in which no beetles have been located. Owing to certain geographical lines, it has been thought necessary to include it in the quarantined area. The natural spread of the beetle on its own wings is approximately fifteen miles in every direction each year.

I am frank to admit that before I visited the infested area I had read much and had heard more about this beetle, and I was convinced that the reports circulated were greatly exaggerated, which is not infrequently true in regard to new pests. However, I can honestly say now that I could enlarge on any of the reports

that I had read concerning the Japanese Beetle and still be within the truth. I wish I were able to give you an adequate description of the swarms of beetles that simply cover everything in this severely infested area, but my powers of description are inadequate. The few days preceding my arrival were the first warm days after the beetles had emerged from the ground. The beetle is not active unless the sun is shining brightly and the air is warm; consequently the damage up until the time of my arrival was rather slight and one would have to get close to a tree in order to see where any material damage had been done. The day on which I arrived and first went out into the orchards the thermometer gradually climbed to 95° and if there was any breeze blowing we did not discover it. It was *hot*. Doubtless you have been under orange trees in full bloom and have heard the buzzing and droning of bees as they visited the flowers. Visualize it—change the orange trees to apple trees and the bees to beetles and multiply the number as many times as you wish and you will have some idea of the swarms and hordes of beetles that were in this area. During the few days that I spent at the Japanese Beetle laboratory, I kept under observation a row of trees along the highway which had not been sprayed or treated for control. Four days later these trees were simply skeletons. During these four days the foliage just melted away and there was nothing left but skeletonized leaves hanging and fluttering in the breeze. Apples in severely infested orchards appeared as shining balls of beetles. The skin of the fruit was absolutely covered. I have an apple here which I picked from such an orchard. This particular apple was covered as I have just described. I took a wide-mouthed cyanide jar, slipped it over the apple, and after all the beetles on the apple were dead I counted 147 of them. If the apple had been larger I am certain there would have been more beetles on it. The infestation on truck crops, field crops, etc., up there was equally as severe as that on fruit. I saw baskets of green corn, with the butt ends of the ears up, by the side of the road waiting to be carried to market. I believe they had been there about an hour and a half. The protruding butts of this green corn were just balls of beetles. I indiscriminately picked up one ear, shook off the beetles, and found that they had eaten off the silk. Upon husking the ear I found thirty-six of them on the inside.

The reaction of the beetles to light is very positive. That is, they will not stay in any dark place. For instance, while walk-

ing over heavily infested areas some of them will start to crawl up your trousers, but as soon as they get in the dark they will turn and go back. If they get into your pockets, they will come right out. Because of the beetle's preference of light to dark, the trees are attacked in a rather peculiar way. The tops and the outer growth are attacked first, but with the melting away of the foliage and the penetration of light to the inner portions of the tree, the beetles gradually move inside. Only a few days elapse before the foliage is in a skeletonized condition.

Lawns and golf greens also have suffered severely. The grubs, during the nine months that they live in the soil, feed voraciously. They come up to within two inches or so of the surface of the ground and eat up the roots of grass. The infestation in the ground may be so severe that it is not uncommon to find from five hundred to a thousand grubs per square yard, and they are so numerous that they can be raked up with the fingers.

While at the Japanese Beetle laboratory, I witnessed several demonstrations showing control methods. It has been discovered that the beetles are attracted by various odors, and particularly by a compound called geraniol. Geraniol is one of the ingredients in oil of geranium and other essential oils. An emulsified solution of geraniol was sprayed onto a tall tree in one of the orchards. Only a few minutes elapsed before the beetles on adjoining trees were attracted to it and as the odor spread out farther and farther from the sprayed trees they became very much excited, left the trees on which they were feeding and accumulated on this tree. It appeared that the beetles were being attracted as far as a quarter of a mile. The sprayed tree was left undisturbed only about twenty minutes, but during that time so many beetles had come that they hung in masses and the smaller limbs were bending under their weight. After enough beetles had gathered on the tree, it was sprayed with a contact insecticide called pyrethrum oleo resin. A powerful spraying machine capable of delivering a large volume of spray per minute is employed. As the beetles are very active and easily disturbed the tree must be sprayed as quickly as possible or many of them would escape. The tree is therefore swept machine-gun fashion with the forceful, drenching spray in order to hit as many beetles as possible in the shortest time. The pyrethrum in the mixture paralyzes the beetles and they fall to the ground. The oleo resin does the final work of killing them.

The ground under the sprayed tree was literally covered with the dying, squirming beetles. They were simply there in myriads.

Many beetles have also been successfully trapped, geraniol being used as a bait. The traps consist of cages about the size of a gallon syrup can. Inside is suspended a shallow dish or pan with a hole in the middle. This dish is filled with bran impregnated with a solution of geraniol. In the hole in the dish is placed the spout of a funnel. The beetles, attracted by the odor of the geraniol, crawl into the funnel, hit the sides and fall through the hole in the funnel down into the catch basin in the bottom. On a day preceding my arrival the number of beetles caught in one of these trap-cans in twenty-four hours was, by actual count, 10,872. There were twenty-one traps in the orchard at that time and the record for that day was over 87,000 beetles.

The beetles will not eat the common stomach poisons used for poisoning other insects. If such poisons are sprayed onto a tree they merely act as repellents and the beetles cannot be induced to eat them. Therefore, a common practice which is now being followed, not for controlling the beetles but for protecting the orchards, consists in spraying the trees with a mixture of two pounds of flour and one pound of arsenate of lead in water. The whiter the coating on the leaf, the greater the repellent action. Not only arsenate of lead, but practically any sort of dust or any coating on the leaf will act as a repellent.

Several parasites of the beetle have been introduced from Japan and these seem to be making some headway. The results so far are at least encouraging and it is hoped that some of these parasites will effect, if not a complete control, at least a partial control in the future.

The beetles are very strongly attracted to each other. An apple may have two or three beetles on it, and in five minutes that apple will be covered about as I described the one I passed around. If some repellent is used before the beetles emerge from the ground the prospect of getting through the season without damage to the crop is excellent; but if a few beetles come in, large numbers will follow until they fairly swarm.

The introduction of the beetle into Florida by natural spread is still remote. The spread, as previously stated, is about fifteen miles a year, and of course Florida is a thousand or more miles from the present known infestation. However, the introduction

of the beetle by some artificial means is something to be pondered with great misgivings. It is not only possible to transport this beetle on living plants and in soil about the roots of nursery stock, but automobiles, trains, box cars, and in fact all vehicles that pass through the infested area while the beetles are flying are potential means of spreading this pest. The question of carrying it on nursery stock is one of vital importance to us. It has been the experience in the infested area that many of the plants which are moved with balls of earth around the roots are infested with the grubs. They are in the soil in the grub stage and it is quite possible to carry this beetle great distances, at least as far as the stock itself can be safely shipped, and an absolutely new infestation started in a single season. The federal and state authorities are giving the nurseries in the infested area as nearly perfect supervision as human agencies can devise. The work that they are doing is good, but they are working under tremendous handicaps. The beetle can fly considerable distances and it can be carried by other means. I am frank to admit that, in my opinion, all efforts to keep this beetle from spreading are doomed to failure. The authorities are doing good work and retarding its spread, but it is certainly going to get away sooner or later. The danger of introducing the beetle in nursery stock from the nurseries in the infested area is great, and I am firmly convinced that the horticulturists and agriculturists of Florida could do their state and their community a worth while service if they would order their ornamental plants from areas outside the infested district. What the result would be should the beetles get into Florida, we can only guess; but with our warm, sunny climate and twelve months of food supply, it need not stretch one's imagination a great deal to visualize a terrible scourge. The life cycle may be the same here as it is in New Jersey, or it may be different. We do not know. Under greenhouse conditions in New Jersey adult beetles have been reared in December from eggs laid in June, and as our climatic conditions largely parallel greenhouse conditions, it is within the realm of probability that we might have two swarms of these beetles a year instead of only one, as they have in the North.

JAPANESE BEETLE: (1) Giubs, natural size; (2) Adult, natural size; (3) Grub, enlarged 5 times; (4) Adult, enlaiged five times. (Photographs through courtesy of United States Department of Agriculture, Japanese Beetle Project, Riverton, N. J.)

COPY OF LETTER SENT BY NURSERY INSPECTOR TO RECEIVERS OF PLANTS FROM AREAS INFESTED WITH JAPANESE BEETLE

Gainesville, Florida,

Dear Sir:

The Federal Horticultural Board has just advised us that you will shortly receive plants from a nursery located in Japanese beetle infested territory. We believe these plants are dangerous, unless properly safeguarded, and desire to call your attention to same.

The Japanese beetle was introduced into New Jersey from Japan in soil about the roots of iris plants some time before the summer of 1916. It is the most devastating insect pest introduced into the United States in many years. The young insects feed on the roots of plants and live in soil two-thirds of the year. The adults emerge in summer and feed upon the foliage of over two hundred different plants, including most of those of economic importance, such as apple, grape, peach, plum, sweet potato, beans, corn, rose, ferns, cannas, oaks, etc. To illustrate how abundant they become, 1500 grubs have been found in a measured square yard of soil and the United States Department of Agriculture reports that "In an orchard of 156 ten-year-old Red-bird peach trees, thirteen 16-gallon tubfuls of beetles were shaken from the trees and collected early one morning in somewhat less than two hours. The next morning the beetles were apparently as numerous on these trees as before." Literally hundreds will cluster on an apple or peach eating all save the core or seed, which will be left hanging in the tree. Poison sprays are ineffective, acting only as repellents. The havoc wrought by these insects, when abundant, defies description.

Recognizing the seriousness of the menace the Plant Board adopted Rule 44, October 13, 1919, prohibiting the introduction into Florida of plants with soil from the infested region and adjacent territory. This seriously interfered with the sales of some large nursery firms in the vicinity of Philadelphia and they started at once, by propaganda and pressure, to force their plants with soil into Florida.

On April 28, 1924, the Federal Horticultural Board, United States Department of Agriculture, called a conference of State Inspection Officials to consider the matter of interstate quaran-

times. The Federal officials supplied information showing that court decisions indicated that in case both the Federal and State authorities acted on a subject the Federal regulations prevailed and that the State regulations that were in conflict with the Federal regulations or exceeded them in scope were null and void. The various State officials were virtually instructed by the Federal Horticultural Board to revise their rules and regulations so that they would not conflict with or exceed the Federal Horticultural Board's regulations. Reluctantly complying, the State Plant Board repealed its Rule 44, and requested the Federal Horticultural Board to send a record of all plants certified for shipment from Japanese beetle territory to Florida points. Shipments of such plants have been coming in at a constantly increasing rate from the heart of the beetle infested region, many of them with soil about the roots.

We are enclosing a reprint from the Quarterly Bulletin of the State Plant Board, Volume XI, Number 1, in which is given an idea of what may be expected should this pest become established in our state. We are also enclosing a picture of the grub and adult stages of the Japanese beetle, natural size and enlarged. Should you, at a future date, see an insect resembling this pest attacking your plants, send specimens in a tightly closed box to the undersigned for examination.

We are writing to ask that immediately on receipt of these plants you wash all particles of soil from about the roots into a cloth sack, put the sack, soil, packing material, and all into an oven and bake it at a high temperature long enough to kill any Japanese beetle eggs in the middle of the soil (about one hour in a hot oven).

Please do not plant these plants with any soil about the roots. To do so might easily fasten this great pest upon your county and your state.

Yours very truly,

J. C. Goodwin,
Nursery Inspector.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

WILMON NEWELL, *Plant Commissioner*........ *Editor*

ASSOCIATE EDITORS

E. W. BERGER........ *Entomologist*
J. C. GOODWIN........ *Nursery Inspector*
J. H. MONTGOMERY .... *Quarantine Inspector*
.... *Plant Pathologist*

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

DEPARTMENT REPORTS

NURSERY INSPECTION DEPARTMENT

NURSERY INSPECTOR'S SUMMARY FOR MONTH ENDING FEBRUARY 29, 1928

Number of nurseries inspected		1,008
Quantity of stock inspected:		
Citrus	8,118,343	
Non-Citrus	14,892,293	
Total		23,010,636

BEE DISEASE ERADICATION

REPORT FOR MONTH OF FEBRUARY, 1928

Number of apiaries inspected	14
Number of colonies inspected	255
Number of apiaries infected with American foul brood	0
Number of colonies infected with American foul brood	0
Number of colonies destroyed	0
Number of apiaries infected with European foul brood	0
Number of colonies infected with European foul brood	0
Number of colonies destroyed	0

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S MONTHLY SUMMARY

FEBRUARY 1928

SHIPS AND VESSELS INSPECTED			
From Foreign Ports			
Direct	311		
Via U S Ports	56		
Total		367	
From U S Ports other than Florida		147	
From Florida Ports		72	
Total			586
NUMBER OF PARCELS INSPECTED			
Arriving by water			
Passed		72,578	
Treated and passed		63 213	
Returned to shipper		349	
Contraband destroyed		993	
Total			137,133
Arriving by land—express freight wagon, etc			
Passed		324	
Treated and passed		288	
Returned to shipper		2	
Contraband destroyed		2	
Total			616
Arriving by mail			
Passed		508	
Treated and passed		5	
Returned to shipper		1	
Contraband destroyed		8	
Total			522
GRAND TOTAL OF PARCELS INSPECTED			138,271
Number of parcels on hand pending determination as to final disposition			0

DEPARTMENT OF CITRUS CANKER ERADICATION

Report on Eradication Work in Cooperation with the Bureau of Plant Industry, United States Department of Agriculture, for Month of February, 1928

Citrus grove trees inspected	1,342,993
Citrus nursery trees inspected	0
Inspectors employed on citrus canker eradication	34
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

General Summary

Florida counties in which canker has been found	26
Grove trees found infected since May, 1914	15,243
Nursery trees found infected since May, 1914	342,260
Number properties found infected to February 29, 1928	515
Properties declared no longer danger centers	512
Properties still classed as actively infected February 29, 1928	3

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to February 29, 1928:

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Tot'l
1914	....	....	....	....	108	160	275	1313	767	565	773	366	4327
1915	306	165	444	408	1042	772	651	1345	618	214	494	256	6715
1916	86	21	49	49	338	450	349	219	124	451	131	27	2294
1917	14	4	9	169	52	45	39	30	6	2	1	1	372
1918	0	1	1	2	1	10	0	0	0	0	0	0	15
1919	0	0	1	1	1	0	0	1	0	0	0	0	4
1920	0	0	0	0	0	0	539	1	0	0	0	0	540
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	585	168	28	34	23	19	12	4	873
1923	1	1	2	3	2	1	0	0	0	1	0	0	11
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	5	0	0	0	0	0	0	0	0	0	5
1926	0	0	0	0	0	0	0	0	0	0	0	2	2
1927	0	0	0	0	0	0	0	0	0	0	85	0	85
1928	0	0	....	....	....	....	....	....	....	....	....	....	....

THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII April, 1928 No. 10

EDITORIAL NOTE

The material presented in this issue of The Monthly Bulletin consists of a series of four papers presented at the forty-first annual meeting of the Florida State Horticultural Society held at Winter Haven, Florida, April 10, 11 and 12. The program of the meeting for the morning of April 12 was a symposium on plant protection. The papers printed herein were presented at this symposium. The editors feel that the information is of such a nature that it should be given as much publicity as possible and the articles are therefore being printed in the Bulletin. The papers presented are as follows: "Protecting Florida's Agriculture," by Wilmon Newell, Plant Commissioner; "Changed Conditions in Reference to Plant Quarantine," by J. H. Montgomery, Quarantine Inspector; "The Nursery Inspection Situation," by J. C. Goodwin, Nursery Inspector; "Alien Plant Pests Now Threatening Florida," by L. R. Warner, Assistant Quarantine Inspector. At the conclusion of Doctor Newell's paper, a "movie" film was shown depicting actual scenes in connection with the citrus canker eradication campaign. At the conclusion of the paper presented by Mr. Warner on "Alien Plant Pests Now Threatening Florida," a number of slides were thrown on the screen depicting various activities in connection with the work being done at the several ports of entry. A number of these slides are being made use of for illustration purposes in the accompanying articles.

PROTECTING FLORIDA'S AGRICULTURE

By WILMON NEWELL[1]

In presenting this symposium on plant protection we are not undertaking to raise the cry of "wolf." Rather, we shall endeavor to place before you as fairly and truthfully as possible the cold, bare facts regarding the situation in which Florida finds herself today with reference to protecting her vital industries against serious insect pests and plant diseases.

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[1]Plant Commissioner, State Plant Board.

My own part in this program is to try to place before you a general view of the entire situation and this will be followed by others who will speak to you upon particular and specific phases of the problem.

If we say things this morning which you have heard us say before, we can only plead in extenuation that what was true yesterday is probably true today and that dangers cannot be dismissed by ignoring them.

Protection of Florida's agricultural industries against the introduction of plant diseases and insect pests is a vital matter. While much emphasis is quite properly being placed on the improvement of varieties, cultural methods and fertilizer practices and upon improved marketing facilities; the fact remains that all of these efforts will prove unavailing if some devastating insect or disease destroys all or the greater part of the crop involved.

Many of Florida's most important crops today owe their existence to the fact that certain dangerous pests have been kept out of the State. Other industries have not been so fortunate; plant diseases have overtaken them and they have passed into history. An example is found in pear culture which was once a great industry in Florida but which gave way before the ravages of pear blight.

To afford the type of protection so essential is the function of the State Plant Board, created by Acts of the Legislatures of 1915 and 1927, and charged with the establishment and execution of plant quarantine measures, with eradicating dangerous insects and diseases and with preventing their spread. The Board is charged, also, with eradicating and preventing the spread of infectious diseases of honey bees.

The plant quarantine work of the Board is carried out in cooperation with that of the Federal Horticultural Board. Inspectors are stationed at all of Florida's maritime ports, where they enforce both the state and federal regulations with reference to the importation of plants and plant products. These inspectors, working with and alongside the customs forces, meet all arriving vessels, whether coastwise or from foreign countries, and inspect cargoes and passengers' baggage and even the holds, cabins, crew's quarters and storerooms of the vessels themselves. This is a prodigious task, as shown by the fact that during the fiscal year which ended June 30, 1927, such inspec-

tions were made of 2,989 foreign vessels and 2,991 coastwise vessels arriving at Florida ports. During this same period, 2,391,591 packages or containers were inspected and out of this number 8,775 packages were found to contain either dangerous pests or material considered dangerous to the agricultural industries of Florida. Of these, 3,538 packages were destroyed and 5,237 returned to the shippers.

The interception of dangerous insects or diseases is of practically daily occurrence. In one year, new or dangerous pests were intercepted from forty-two foreign countries and the interceptions have included such pests as the Mediterranean fruit fly, Mexican orange maggot, West Indian fruit fly, blackfly and a host of scale-insects not now known to occur in Florida.

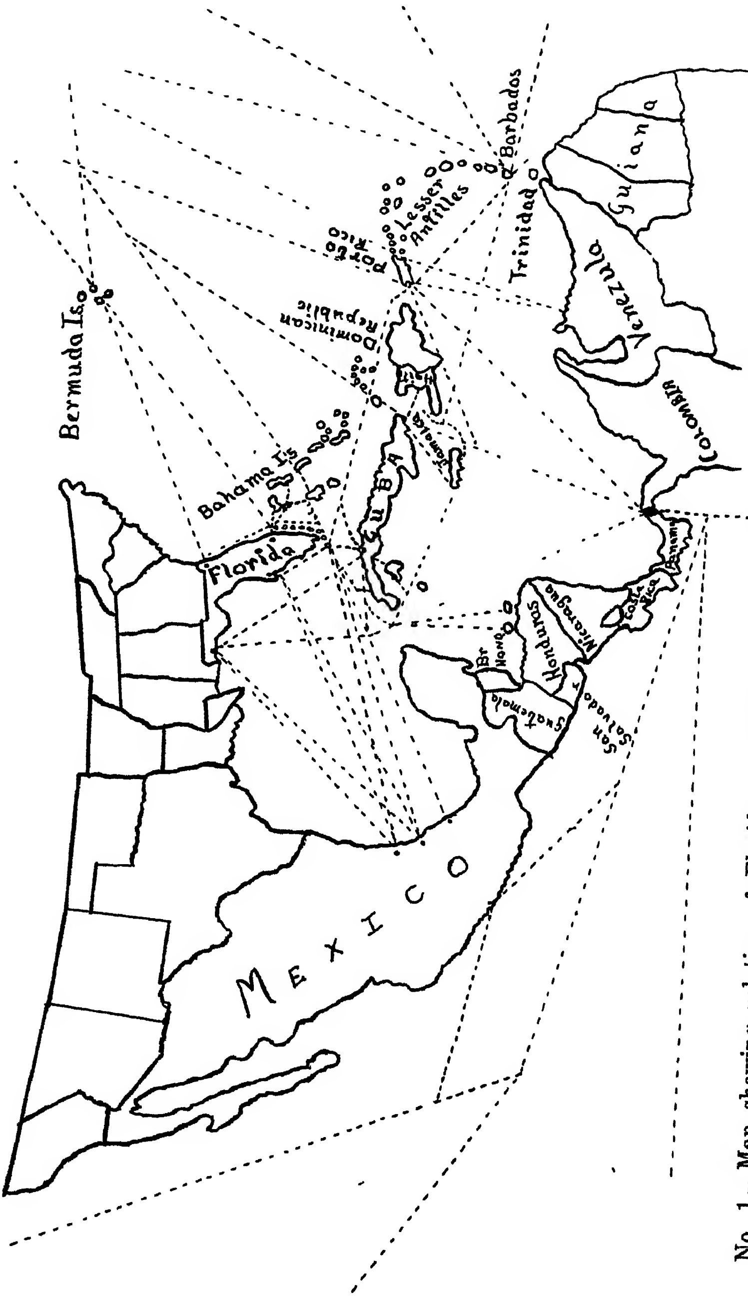
Interceptions during the past year have included the Blackfly, West Indian Fruit Fly, Green Scale, Masked Scale and Stellate Scale. The first four of these are citrus-infesting insects.

The work of inspection at the ports is continuous, day and night, Sundays and holidays, for pests are no respecters of either the clock or the calendar.

Thorough as the quarantine work is, it cannot be made infallible. There is a limit to human endurance and the members of an all-too-small inspection force, who often work sixteen to eighteen hours a day and meet vessels at three o'clock in the morning, cannot always see everything or anticipate every contingency. Numerous attempts are made to smuggle plants into the State and each year the ever-increasing multiplicity and speed of commercial and private means of transportation add to the difficulty of detecting and excluding foreign pests. No matter what the dangers or the volume of traffic, no more inspectors can be employed than is provided for in the appropriation budget.

It is quite logical that the Plant Board should have a "second line of defense" for, necessarily, some pests must slip in despite all vigilance. This second line of defense is found in the Board's work of nursery and orchard inspection.

The Nursery Inspection Department keeps under continuous inspection all commercial nurseries in the State for a two-fold purpose: first, to detect any new pest before it becomes widely distributed and while its eradication is still possible. In the second place, the constant inspection of the nurseries—with the imposition of quarantines on them when the trees and plants do



No. 1.—Map showing relation of Florida to Central and South American countries and the West Indian Islands
Principal steamer lines shown by dotted lines.

not come up to a high standard—relieves the grove owner or planter from having to start his commercial operations under the handicap of plants heavily infested with whitefly, scale-insects and other pests. This work requires the undivided attention of a chief nursery inspector and fifteen highly trained assistants for there are 62,522,041 trees and plants in the 1,483 commercial and 862 non-commercial nurseries in the State.

One of the outstanding accomplishments of the Plant Board has been its campaign to eradicate citrus canker. This disease found its way into Florida about 1912 and, during the succeeding five years, threatened to wipe out the citrus industry. In cooperation with the Bureau of Plant Industry, United States Department of Agriculture, an active campaign against this disease was inaugurated immediately after the creation of the Plant Board in 1915 and has been waged relentlessly ever since. From 1914 to 1917 the losses from citrus canker were heavy but gradually, one after another, foci of infection were wiped out and recurring outbreaks of the disease became less frequent. For the past ten years commercial damage from this disease has been kept practically at zero. Occasional infections are still discovered and are as promptly stamped out by the Board's inspectors.

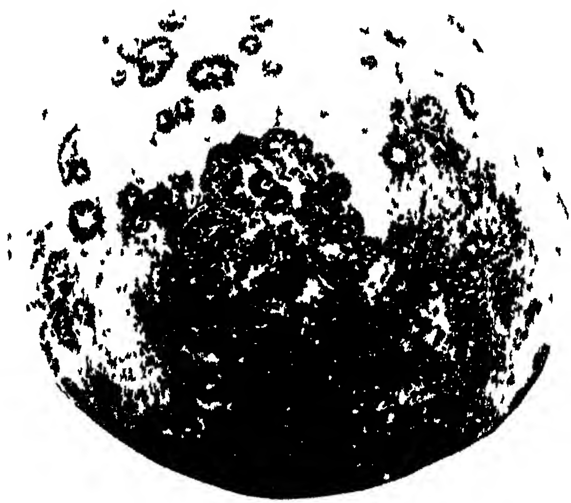
Because of the extreme virulence of citrus canker and the many opportunities for its reintroduction, the citrus industry may look forward to having this menace hanging over it for all time to come.

A force of thirty expert "canker hunters" is continuously engaged in systematically patrolling the citrus groves of the State. However, as there are approximately 20,000,000 grove trees to be inspected, it takes these men three years to make just one hasty inspection for citrus canker! It is frankly admitted that this force is totally insufficient for safety. It is nothing but a miracle or act of Providence that outbreaks of the disease have thus far been discovered before they assumed large proportions. There may easily be, at this moment, one or more unknown areas of infection of such magnitude as to require the expenditure of a hundred thousand dollars for eradication.

Experience has shown, time after time, that it would be economy for the State to expend more for grove inspection and, as a result, less for eradication; for when a canker outbreak has the opportunity to spread for several months—before the inspectors find it—the cost of stamping it out is invariably from \$15,000 to \$50,000.

It would perhaps be interesting to discuss the campaigns which have been or are being waged by the Plant Board to eradicate or limit the spread of bee diseases and of such pests as the coconut bud-rot, banana weevil, sweet potato weevil and others but time does not now permit.

In conclusion, it must be pointed out that changing conditions have greatly increased and complicated the difficulties of the Plant Board in protecting the State's vital industries and, regrettable though it may be, the State itself has not afforded the Board opportunity to keep pace with the changing conditions and new dangers. As a concrete example: Funds were not appropriated for the Board to continue its campaign against the mosaic disease of sugar cane with the result that this disease has, during the past eight years, steadily made its way from



No. 2.—Grapefruit infected with citrus canker.

extreme northwestern Florida to all parts of the State and right into the Everglades, where it is proposed to build a great sugar industry!

Not all of the difficulties are chargeable to lack of appropriations. The State has failed to provide inspectors of the Board with police authority, quite necessary, we believe, if certain situations are to be dealt with.

Not all of our dangers are due to pests still in foreign countries. When the Japanese beetle—now infesting large areas in

New Jersey and Pennsylvania—establishes itself in Florida it will cause more consternation than citrus canker ever did. When the European corn borer—which has already occupied the territory from Massachusetts to Indiana—and the pink bollworm of cotton—which has recently been found over an area of 500,000 acres in Texas—establish themselves in Florida it is not impossible that our corn and cotton crops will repeat the history of the pear industry of years ago.

Ten years ago, practically all shipments of nursery stock, plants of all kinds and fruits and vegetables came into Florida from other states by freight or express. It was possible for the Board's inspectors to examine practically all shipments and intercept dangerous materials. Today the amount of such material coming into Florida by parcel post and by private and commercial motor vehicles is probably much greater than the amount coming by rail.

While the Plant Board can secure, from federal sources, the privilege of inspecting certain classes of mail matter, it has not been provided with men or funds for the work.

Automobiles and trucks cannot be stopped at the state line or on the highways and their contents investigated unless the Board's inspectors are provided with police authority.

The development of the magnificent road system in Florida and adjacent states, coupled with the great increase in motor vehicles, has introduced into the situation the most terribly efficient means of pest distribution the world has ever seen. Already the airplane is beginning to contribute its part to a still more rapid spread of pests.

Unless the Florida growers and those interested in protection of their fields and groves take cognizance of this situation and take steps whereby it may be dealt with, the future resultant losses will be staggering, if not disastrous. Even increased expenditures for insecticides, spraying and fumigation in dealing with new and more pests will not meet the situation, for it is to be remembered that there are many pests and diseases for which science has as yet found no palliative or control measure and sometimes an industry expires before frantically working scientists can find a way to save it.

It is not a job for tomorrow, for tomorrow may be too late.

CHANGED CONDITIONS IN REFERENCE TO PLANT QUARANTINE

By J. H. MONTGOMERY*

I am afraid that when I have finished talking you will say I have talked about anything and everything but my subject. However, I can assure you that no matter how far I have seemingly wandered from the title of my talk there will be a relationship which is inescapable.

No. 3.—Infested palms intercepted at Key West Note the posters in both Spanish and English Such posters are placed in baggage inspection sheds at ports and on board passenger boats operating on schedule into Florida ports.

Changed conditions in reference to plant quarantine. I wonder how many of you know, except in the most general sort of way, just exactly what is meant by "plant quarantine." It may be well, therefore, to first answer the question, What is a plant quarantine and why? Briefly, a plant quarantine is an instrument for protecting the agricultural industry against introduction of and distribution of plant pests. Such precautionary meas-

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ures may be either restrictive, that is, regulatory in their nature, or prohibitive. In the first class plants and plant products are admitted into a state or country under certain specific regulations intended to safeguard. In the second, the particular plants or products are absolutely prohibited entry or passage. Needless to say, the latter provides the greatest protection but it is a drastic measure which can and should be made use of only when the danger is great and the interests exposed to the menace are of great commercial importance. It must be borne in mind that the interruption and disruption of trade and commerce involved through the imposition of a prohibitory quarantine are not only direct but far reaching in effect.

Quarantines, whether prohibitive or restrictive, may be either foreign or domestic, and of the latter they may be those affecting intrastate and interstate movements. Plant quarantines of whatever nature may be imposed either through federal or state agencies, or both. In the event of the Federal Government, through its Federal Horticultural Board, taking action on a subject, state quarantine action cannot exceed the federal action. Sometimes this occasions differences—not often. A case in point is the Japanese beetle quarantine.

And now what do we mean when we refer to "changed conditions in reference to plant quarantines?" Simply this: The determination of imposition, and afterwards the administration of, plant quarantines is vastly different now from ten or fifteen years ago.

Fifteen years ago, ten years ago, the administration of a domestic quarantine was a relatively easy matter. Being so, we must admit there were abuses. Too frequently quarantines were promulgated which were not fully justified. All that was necessary was a situation which could be used as a reason (or excuse) and a quarantine was immediately promulgated. And it was easily applied, too, for the only agency of importance involved was the common carrier. How different it is today. With the development of motor transport and the construction of improved public highways, the whole situation has changed. A simple problem has become one full of complexities. The opportunities for spread of plant pests through transportation have been multiplied many fold. Today—and I make this statement advisedly—the application of a domestic quarantine, especially one of a more or less general nature or one with respect to a

minor pest, is a mere gesture. To efficiently administer such would require an army of men to patrol our roads and act as guards where main highways, and byways also, cross our state lines or other quarantine lines. So then we may well ask ourselves, why make the effort? Why dissipate our resources on little things or abortive activities? Why not concentrate on the big things? Why worry and waste time, effort and money to intercept in transit a few (or even many) plants affected by, we will say, root knot or the commoner scales when there are big problems demanding attention and solution? I do not mean by that that the movement of such infested material should be encouraged. Quite the contrary. But I believe, though, that means other than interception can be used to attain the results sought

I have stated my belief that under conditions as they are now—conditions vastly different from those of ten or twelve

No. 4.—Illegal shipment of avocado trees infested with blackfly and destined to Fort Myers, Florida. Confiscated at Tampa in possession of passenger from Cuba.

years ago—domestic quarantines are ineffective. At best they can only be regarded as retardants and of course as such possess value. Cases in point are the Japanese beetle and corn borer quarantines, both of which are restrictive or regulatory in their nature. It must be admitted that restrictive measures are much more difficult of application than prohibitive quarantines or embargoes. Such measures, embargoes, are unquestionably justified only where enormous financial interests are involved, where basic industries are threatened. As an illustration may be cited California's prohibition, absolute, on Florida citrus fruit on account of citrus canker. As a general proposition, however, it may be stated that domestic quarantines of an absolute nature are to be approached with caution and trepidation, for there may be lack of justification and there is always the likelihood of ineffectiveness. It must be remembered that few, if any, of our states are as fortunately situated from a quarantine administration standpoint as is California with her natural mountainous and desert barriers through which there are only a few gateways.

We have been discussing domestic quarantine activities which, important as they are, cannot be compared with that other and greater problem, foreign quarantines. Listen!! Every one of our major plant pests, with a few exceptions, is an invader from foreign lands. They are costing us millions of dollars annually. Are there more of them, seeking entrance? There are. Do we want them? No. Can they be kept out? Yes. At least there is a good chance. Will they be kept out? *I don't know*. The above sounds as though it might have been extracted from McGuffy's First Reader. It is indeed primary, elementary. I have observed frequently that things that are perfectly obvious are overlooked or disregarded just because of that fact.

Conditions are changing in our foreign quarantine situation just as they are domestically. Rapid steamers equipped with modern refrigerating plants are bringing foreign plants and plant products nearer and nearer to us, speaking in terms of time and opportunity. New problems are constantly arising. Good roads and motor transport promise to play an important part in our relations with foreign countries, even with foreign countries separated from us by the sea. This is an amazing statement. Nevertheless, it is true. There is now being completed a state highway from the Florida mainland via a chain

of small islands to Key West. At the same time the Cuban Government has launched a national road-building program, the main project of which is the construction of a seven hundred fifty mile stem from the east end of the island to the west end, all parts of the system to center at Havana. Also at the same time the P. & O. Steamship Company operating between Florida and Cuban ports, we are informed, is planning the construction of huge ferry boats to transport automobiles. Just imagine the difficulties attached to handling this situation when added to our present big problem of passenger steamers and railroad car ferries. I mention this by way of illustration. Other situations could be cited of the constant change under way.

No. 5.—Citrus leaves showing infestation by "blackfly." Left, egg spirals. Right, larvae.

Amazing as the preceding statement may appear to be, it is not nearly as startling as the one I am about to make. What I have said is not the dream of a lot of impractical individuals. On the contrary, it represents the well considered and carefully thought out plans of hard-headed business men and statesmen. Now looking somewhat further into the future—and this may be taken by you as somewhat prophetic—what do we see? Some of you may now have a mental picture of the geographical re-

lationship of Florida to the West Indies, South America and Central America. If not, let me ask you to refer to your map when you get home. You will see that Key West is the strategic point for the entry into this country of motor vehicles from all of this vast area, which traffic will be by way of a great system of highway and ferries. There is nothing chimerical about this. Men with big minds are now engaged in making plans for just such a system of interlinking communication channels. Let me try to picture for you at least a part of this plan.

(a) It is ninety miles from Key West to Havana.

(b) Thence travel will be over the Cuban highways to the east end of the island where a ferry—forty miles—will operate to Haiti and Santo Domingo. Here good military roads constructed during the United States Marine occupation already exist.

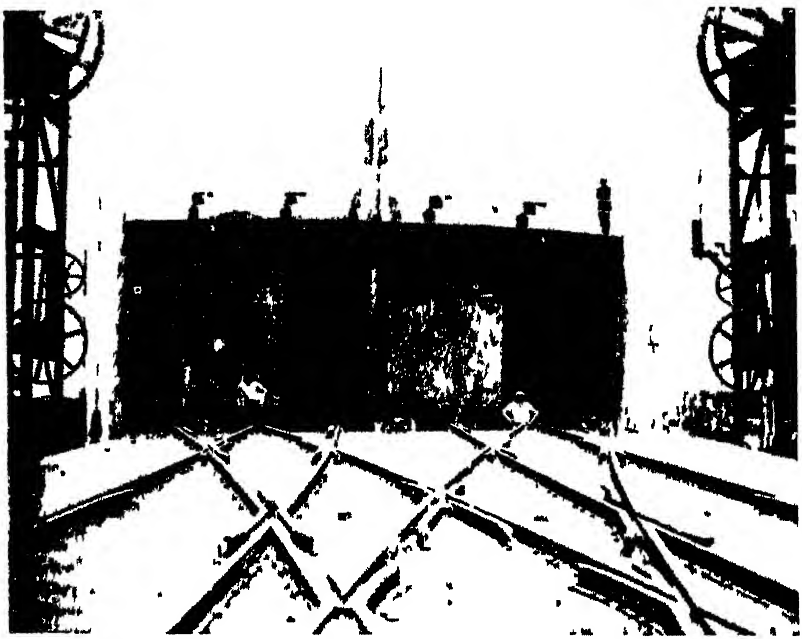
(c) Then a sixty mile ferry is projected to Porto Rico, where already is a good road system.

Now let's travel to the west end of the Island of Cuba. It is about one hundred and twenty-five miles across the Yucatan Channel. At this point connection might be made with the proposed intercontinental highway from North America to South America.

To the horticulturist and the horticultural inspector interested in protecting a huge industry from dangerous foreign plant pests this is certainly not a pleasing picture. But the picture is not yet complete. Even now our inspectors at Key West and Miami are supervising entry of many planes, both regular commercial and casual, plying between Florida, the Bahamas and Cuba. Each year this problem will become greater. Key West will likewise be the strategic point for airplane entry from the West Indies, Central America and South America. I say it is not impossible or unlikely. Why do I tell you of this?

Every one of those automobiles and airplanes will serve as carriers of plants and plant products. The tourist returning by steamer is limited as to carrying capacity. The same individual traveling by automobile will not have the same limitation. Plants, fruits and vegetables will be loaded into the machine either for consumption or transport home for ornamental planting. And what are these terrible pests which we fear so much? A few instances will suffice: (1) The spiny citrus whitefly (blackfly), a close relation to our common whitefly, is firmly

established in the Bahamas, Cuba, Jamaica and Central America. The once thriving citrus industry in the Bahamas is a thing of the past, due to this pest. Citrus plantings in the vicinity of Havana have been abandoned, due to this pest. (2) The Mediterranean fruit fly, perhaps the most dreaded plant pest, which has a wide range of hosts. (3) The West Indian fruit fly. (4) The Mexican orange maggot. The former is quite prevalent throughout the West Indies and the latter occasions enormous losses to the fruit industry in parts of Mexico. (5) Last, but by no means least, we have citrus canker.



No. 6.—Railroad car ferry operating between Key West and Havana. Capacity thirty cars.

Florida has a citrus fruit industry worth an annual income of fifty or sixty millions of dollars. The only thing that stands between the prosperity of that industry and these threatening pests is the inspectional force at our ports of entry. The strength or weakness of that protective cordon depends entirely on the resources available for employment of inspectors. If the machinery is adequate the protection will be proportionate, and vice versa.

In the past our port guardians have again and again prevented invasion. On fifty-nine occasions blackfly has been intercepted. Twenty-nine times they have "caught" fruit infested with the maggots of West Indian fruit fly. Mediterranean fruit fly has knocked at our portals and been refused entry. Only a couple of weeks ago our inspectors at Tampa discovered more than one hundred oranges in various parts of a steamer from a Mexican port. From one of these alone eighteen live, wriggling, squirming Mexican fruit fly maggots were removed.

We would not have you understand that if any one of these pests gained entry it would be impossible to produce some fruit. You certainly could, but the yield would be greatly curtailed. It might no longer be profitable to grow oranges. Sometimes losses to fruit crops from fruit fly damage have been as great as fifty or sixty percent. At that rate, or even a less rate, commercial fruit growing could not be continued. But there is still another prospect. If and when any one of these major pests becomes established or is found to be present in Polk County, we will say, right then an ironclad quarantine would be imposed and you would have ten or twelve million dollars worth of fruit on your hands. No chance of shipping it.

Citrus fruits are not the only ones subject to attack by members of the fruit fly family. Peaches, pears, plums, grapes, mangoes, guavas and many others are hosts. In Hawaii about the only fruits which are produced commercially are pineapples and bananas. If a resident of Hawaii wants to grow a peach, for instance, he must tie a paper bag around the young fruit; otherwise it is a 100 to 1 shot that he will have a lot of worms in his peach.

Why should we submit this information to you? Because it is your business. As quarantine men it is our business to administer the state funds placed at our disposal in such a way as to give the maximum degree of protection. It is *your* business, however, which is being protected and safeguarded. The State Plant Board can only function as its man power will permit and can only employ as many inspectors as its budgetary provision allows. The adequacy of appropriations for carrying on this work, which is of interest and importance to all of Florida (for after all Florida's prosperity is in large measure dependent on the success of its citrus industry) rests with the people affect-

ed—primarily with the producers but finally all of the people. It is up to you.

There is still another way in which you may assist us and at the same time help yourselves. With the limited number of men available for inspectional work, it is of course impossible to keep the groves of the state under as close supervision as should be. Therefore each grower, for his own protection, must constitute himself an inspector. When anything of an unusual nature is noted which the grower cannot recognize, or when something appears which leads the grower to suspect that some one of the major pests is present, it is his duty to submit specimens to the Plant Commissioner without delay.

No. 7.—Sea-plane passengers from Cuba debarking at Key West. Note bouquet in hand of lady passenger. Inspectors frequently find such flowers carrying "blackfly."

In conclusion I want to drive home with all the force of which I am capable, that changed conditions in plant quarantine work must be met. I believe that the situation demands a development and expansion of the major activities of the Plant Board; a concentration on improvement of (a) the Grove Inspection Department so as to provide for biennial inspections of all citrus groves; (b) the Nursery Inspection Department, so that all commercial nurseries will be inspected bimonthly; and (c) the port quarantine service to the end that all reasonable and effective means may be made use of to prevent further introduction and distribution of plant pests.

THE NURSERY INSPECTION SITUATION

By J. C. Goodwin

The purchaser of a plant is rightfully entitled to receive a plant that is free from especially injurious insects; by the same token, a plant sold, delivered and planted is entitled to an opportunity to flourish and fulfil its mission unhampered and unhandicapped by myriads of pests. This, then, is the mission of the Nursery Inspection Department of the State Plant Board: to keep Florida nurseries under constant inspection to prevent the spread of especially injurious pests on nursery stock. Among the numerous ways that plant pests are disseminated, the movement of nursery stock can be placed in the front rank. When an infested plant is taken from a nursery and planted out, the host lives and carries the pest over from one generation to another. In a nursery where the numerous plants are in close proximity to each other, it is easy for a pest to become established. The field inspectors attached to the Nursery Inspection Department, in their regular routine inspections, carefully inspect the stock in the nursery and thus discover outbreaks while they are still in their incipiency. An outbreak discovered in its beginning will prevent the distribution of the pest not only over our own state but the other states as well because our nurserymen are today shipping material to every state in the Union and to many foreign countries.

There are 2,345 nurseries in this state, according to the last annual report, June 30, 1927. A few have retired from business since this date, but others have entered business and the total nurseries in business in this state today is not far from the figure as of June 30. There were embraced in the 2,345 nurseries approximately 10,000 acres of ground and our records show a total of 62,000,000 plants under inspection. While the acreage in citrus nurseries is double that of ornamental, yet the number of plants in each is about the same. These figures do not include the latest acquisition to our horticulture in this state, the production of narcissus bulbs on a large scale. When the Federal Department of Agriculture imposed the restrictions on foreign bulbs, restrictions were also imposed on the interstate movement of certain bulbs. In order to meet the interstate regulations and afford our people an opportunity to reap the harvest,

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*Nursery Inspector, State Plant Board of Florida.

the Nursery Inspection Department of the State Plant Board undertook to inspect bulbs and thus permit the growers to secure Federal certification. On June 30, 1927, we had under inspection over 50,000,000 bulbs in the hands of 71 growers. Over two-thirds of the bulbs produced in the United States last year were produced in Florida. On the spring inspection the number of growers had increased to 90 and others have signified their intention of growing bulbs, either as a side-line or as a major crop.

No. 8.—Air port at Key West. The plane pictured is tri-motored, eight passenger. One of a fleet operating to Havana carrying mail and passengers.

Now that we have had a glimpse of the work performed, let us consider the how and why of the matter. For the sake of efficiency, the state is divided into inspectional districts. There are 12 such districts now. Each district is in charge of a field representative who has a complete list of the nurseries within his territory and makes inspections of same at regular intervals. Our Assistant Nursery Inspectors are all trained men with years of experience in inspectional work and fully appreciate their responsibility in the protection of our horticultural interests. The size of the district depends on the number of nurseries and acreage involved in the area. When an inspector enters a nursery, he goes there for the purpose of ascertaining what pests are present. He carefully dons his one piece inspection suit when

beginning his work in a citrus property. The inspection is not made the same as you would go out and look over a field of grain. The nursery is inspected systematically and carefully. The inspector goes up one row and down another, constantly on the alert, scrutinizing each and every plant. After the inspection has been completed, the inspector very carefully removes his inspection suit and disinfects same in a solution of bichloride of mercury at a dilution of 1 to 1000. This precaution is taken to prevent the inspector from being a distributor of the very thing he is trying to find. Before leaving the nursery, the inspector makes out a detailed report on the conditions prevailing and this report is mailed to the Nursery Inspection Department at Gainesville. It is upon the findings of the field inspector, together with such other information as may be on record, that the Nursery Inspection Department bases its action. During the fiscal year ending June 30, 1927, it was found necessary to impose restrictions on nurseries, either a portion of the nursery or the entire nursery, 1,080 times. In some instances, the same nursery has had restrictions imposed several times during the year. A quarantine is the last resort: it is invoked after other methods of securing action on the part of the nurseryman have failed. When our field representatives note the presence of some of our more common insects, the nurseryman is advised of the fact and is given an opportunity to clean up in order to prevent a quarantine at a subsequent inspection. Most of the nurserymen seem to appreciate this word of caution and have cleaned up.

Upon receipt of the report from the field inspector, the nurseryman is advised of our action and is afforded an opportunity to secure inspection certificate tags, if the conditions prevailing in the nursery merit such action. Each certificate tag is numbered and the nurseryman is required, under the Plant Act of 1927, to make a record of each sale and transmit to the Nursery Inspector at Gainesville a report showing the name and address of the nurseryman making the sale, the name and address of the purchaser, date, number of the certificate tag attached to the shipment and kind and quantity of the nursery stock. Each report from the nurseryman is filed in the office of the Nursery Inspector as a part of our permanent record. Now, perhaps, you ask why this record. By keeping these invoices or reports on the movement of nursery stock, we have the basis for intelligent eradication work should such be necessary. Let us take,

as an example, what would happen should canker or some other major pest be found in a grove. The first thing we would do would be to ascertain the source of the trees. With this information, we would refer to our files and have immediately available a complete record of the movement of stock from that nursery. With this information at hand, the inspectors would be able to go direct to the recipients of stock from this nursery to ascertain if the same condition prevails elsewhere in the state. Without this record we would have to spend weeks and months trying to locate the various shipments from the nursery where the infected or infested stock was grown. These records are for your protection and our guidance.

During the past fiscal year we were able to inspect nurseries in the state at the rate of 3.5 inspections per annum. This number of inspections is entirely too low. With our tropical conditions, we should have a report on a nursery every 60 days. With our wonderful sunshine and continuous growing weather, it is possible for a plant pest to become numerous almost over night. Under northern conditions where pests develop more slowly, this large number of inspections per annum would not be required. Under our most favorable conditions, we should inspect nurseries frequently—every sixty days is none too often.

During the past several years some of our nurserymen have been prone to rest on their oars and bemoan the fact that business was shot all to pieces. They did not keep their nurseries in good condition and their trees were not thrifty, thus hindering the inspector when he called. A nursery that is in good shape is far easier to inspect than one that is grown up in grass and weeds and fairly reeking with pests. Today, conditions are somewhat improved. Nurseries are receiving better care and some new nurseries are applying for inspection and certification. With the renewed interest, the number of inspectors available will not be able to maintain the average of 3.5 inspections per year. It is impossible and impracticable to rush the inspectors in order to make more inspections because the very nature of the work demands thoroughness. With the decrease in the number of inspections given each nursery during the year, a decrease in the protection afforded will, of course, result. Each grower should therefore consider himself a self-appointed committee of one to see that his own property is kept clean in order to prevent the rapid dissemination of plant pests. There is a limit to

human effort. We can go just so far with the implements furnished. We cannot accomplish the impossible.

If a plant pest should be so thoughtless and inconsiderate as to make its appearance between the times our inspector is at your place, advise us immediately. At the same time, send us specimens in a pasteboard box or tin can. Do not send specimens in an envelope—there is too much danger of the specimens being mashed beyond recognition. By helping us you help yourselves. Through your unstinted cooperation, we will be able to afford you the maximum protection in the everlasting battle against the bug.

ALIEN PLANT PESTS NOW THREATENING FLORIDA

By L. R. Warner[1]

Fighting insect and disease pests is one of the major features of farm work in Florida, so every fruit grower present knows what plant pests are and what harm they can do. It is an old, old story, but one worthy of much repetition, to state that by good fortune up until recent years and by dint of conscientious work of state and federal authorities the worst pests are not known to be established in the state. We of the Quarantine Inspection Department of the State Plant Board think that we have done a great deal toward saving our farmers from these pests.

You often wonder why we tell you so often about these pests. It is because we know what they are doing in other countries and we can picture what they will do here. Past experience has shown that every introduced pest is much more serious when introduced into a new country because its natural enemies are usually left behind. What would not the American corn growers give if the European corn borer had never gained admission? What would not the New Jersey fruit growers give if the Japanese beetle had been kept at home, or if it had only been thoughtful enough to bring its natural enemies along with it? What would not the Texas cotton growers give if the pink bollworm had been kept on the other side of the Rio Grande River? How thankful we of Florida should be that such pests as the blackfly, Mediterranean fruit fly, West Indian fruit fly, Mexican orange maggot, and the pink bollworm of cotton have

[1]Assistant Quarantine Inspector, State Plant Board of Florida.

been successfully kept out and that we have taken steps never to allow citrus canker to come in from the outside if we can prevent its so doing.

In Spain, Italy, the Bermudas, the Hawaiian Islands and a great many other places is now established the Mediterranean fruit fly—the greatest insect scourge of citrus and other fruits known to man. The adult is a bright-winged fly, about the same size as a house fly, and the female of the species lays her eggs

No. 9.—Scene in Customs inspection room. As many as five hundred passengers are frequently carried on one boat arriving at Florida ports. Each one is a potential carrier of plant pests.

in under the skins of all seed fruits and vegetables with the exception of pineapples and green bananas. She is a fond, loving parent and she wants the best for her children. The eggs hatch into hundreds of tiny maggots which burrow and eat and finally grow fat on the juicy pulp of the fruit. Such fruit has no market value. Decay enters. Not only is the crop reduced but should the more sound fruits reach a market, and the purchaser bite into a fruit to find it infested with loathsome fly maggots, he would never again care to repeat the performance.

Each instance of an interception of fruit fly infested material that would otherwise have established such a pest in Florida, not only saves perhaps millions of dollars in appropriations for eradication, but veritably saves our fruit industry in all of its ramifications; for in all of the history of the spread of fruit flies there is not one known instance where once established it has been eradicated. Fruits infested with this pest have been intercepted many times at our ports and we are ever on the lookout.

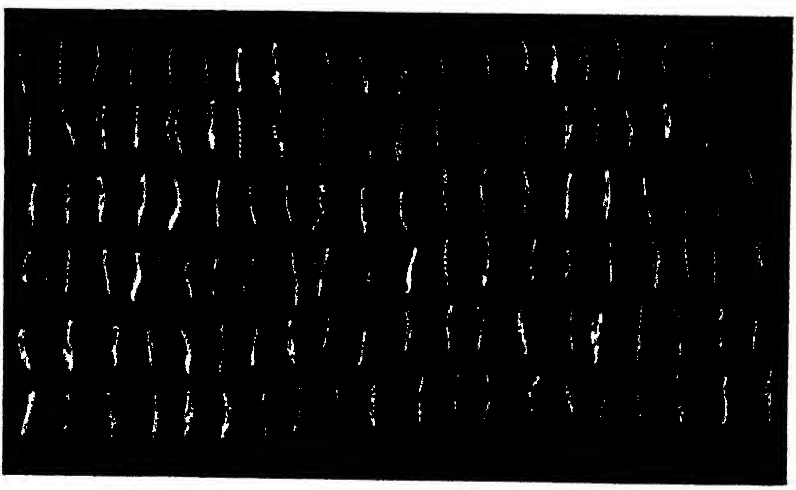
In Mexico there is a first cousin of the Mediterranean fruit fly known as the Mexican orange maggot. The citrus fruits, peaches, mangoes, sapodillas and other fruits grown in Mexico are prime hosts of this pest. For fifteen years none of these Mexican grown fruits have been allowed entry into the United States. I have seen beautifully smooth Mexican grapefruit which on being cut open were found to contain many large, fat maggots of this fly. These infested grapefruit were intercepted at Key West.

The previous speaker has referred to the discovery at Tampa recently of oranges in a vessel arriving from Mexico, and that one of these oranges alone when cut open was found to contain eighteen Mexican orange maggots. Had this fruit been thrown out to rot on the ground here in a vacant lot in Winter Haven it could have been the means of destroying our whole fruit industry.

Did you read of the quarantines against California imposed by other states during the foot and mouth disease epidemic there? Well, if the Mediterranean fruit fly or the Mexican orange maggot were found in Florida you could multiply those embargoes many fold, for there is not an agricultural state in our Union that would not feel justified in quarantining against almost every fresh fruit and vegetable shipped out of Florida lest it bring the deathly plague with it. Recently the statement has been made that $10,000,000 has been returned to Polk County from this year's citrus crop. Had either of these pests been found in Polk County an iron band of quarantine enforcement would have been forged around Polk County to prohibit the distribution of any fruit or vegetable to any point outside. It is terrible to contemplate the financial crash which would follow.

And then there is the spiny citrus whitefly, better known as

the blackfly. From 1916 to 1918 this pest spread from India to Cuba, the Bahamas, Jamaica and Costa Rica. It has been only through eternal vigilance that the blackfly has not got into Florida. It is pounding at the doors. To the east in the Bahamas it has ruined the citrus industry. Several years ago I visited Nassau and rode over the Island of New Providence. The stark, dead skeletons of what were once citrus groves lined the roads. In Cuba I spent six months helping fight this plague. It is one of the whitefly family, but the larvae and pupae are black and shiny and hard and gritty like coal dust. They are ravenous feeders, and on citrus trees they suck the juice till the leaves curl. The fruit from a blackfly infested tree is small and dry and black with sooty mold. By great vigilance the citrus growers of the Isle of Pines have kept their groves free so far. I have seen infested groves in Cuba that had been sprayed monthly with oil sprays at tremendous expense but which were never free of the pest. The Gray Brothers of Cincinnati, who owned one of the show citrus plantings of Cuba near Havana, finally had to quit a couple of years ago. Our men have intercepted this pest dozens of times.



No. 10.—One hundred and twenty fruit fly maggots removed from two infested mangoes.

Another fruit fly pest of major importance that is right at our door is the West Indian fruit fly, infesting all of the thin-skinned fruits such as guavas, mangoes, Surinam cherries, plums, etc. This pest truly surrounds us, as it abounds in the

Bahamas, Cuba, the West Indies and Central America and Mexico. Investigations point to the fact that Cuba is one of the native habitats of this pest, as records back thirty and forty years show it to be a serious pest in Cuba.

It is worthy of mention that in 1925 when Mr. George Moznette made a survey of South America especially with regard to fruit fly infestation he found scarcely a peach fruit free from maggots of the West Indian fruit fly in Tucuman in the Argentine. Of great importance to the United States is the fact that in this same section of the Argentine he discovered, during the month of April, the navel orange crop infested with the same fly maggots. We feel that the interceptions of dozens of maggoty fruits from Cuba and the other islands of the West Indies have been well worth while.

It seems only yesterday that we were feverishly working to exterminate citrus canker from our Florida groves. The memories of those days of heavy losses through grove destruction, land value depreciation, and state, federal and private appropriations and contributions should never be forgotten. They should be a stimulus to our determination to never allow citrus canker or any other pest to enter this state from the outside. It is a great fight but a constantly changing one—just like everything else in our rapidly changing civilization. A few years ago we thought an occasional crowd of one hundred fifty passengers on one boat from Havana was a big one. We have averaged twice that number daily for the past three months with the same force at Key West. And it is not alone at Key West. At Miami and Tampa our work has more than doubled in the past few years. And I daresay the agricultural investments in Florida have also grown apace. We think that this increase of responsibility and change of conditions affecting the quarantine service of Florida should be brought to the attention of Florida fruit growers.

I have necessarily had to leave out of consideration many serious alien pests that are threatening Florida, but I believe it best to emphasize those whose admission would most seriously injure Florida.

We have had prepared a number of slides showing certain phases of the quarantine work, the methods made use of in inspection and so on. These slides will now be shown on the screen with accompanying comments.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

WILMON NEWELL, *Plant Commissioner*........*Editor*

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J. C. GOODWIN........*Nursery Inspector*
J. H. MONTGOMERY........*Quarantine Inspector*
........*Plant Pathologist*

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DEPARTMENT REPORTS

NURSERY INSPECTION DEPARTMENT

NURSERY INSPECTOR'S SUMMARY FOR MONTH ENDING

MARCH 31, 1928

Number of nurseries inspected		1,194
Quantity of stock inspected:		
Citrus	9,570,612	
Non-citrus	12,750,030	
Total		22,320,642

BEE DISEASE ERADICATION

REPORT FOR MONTH OF MARCH, 1928

Number of apiaries inspected	82
Number of colonies inspected	1,806
Number of apiaries infected with American foul brood	1
Number of colonies infected with American foul brood	13
Number of colonies destroyed	13
Number of apiaries infected with European foul brood	0
Number of colonies infected with European foul brood	0
Number of colonies destroyed	0

QUARANTINE DEPARTMENT

QUARANTINE INSPECTOR'S MONTHLY SUMMARY

MARCH, 1928

SHIPS AND VESSELS INSPECTED

From Foreign Ports:			
Direct	316		
Via U. S. Ports	57		
Total		373	
From U. S. Ports other than Florida		161	
From Florida Ports		69	
Total			603

NUMBER OF PARCELS INSPECTED:

Arriving by water:		
Passed	63,150	
Treated and passed	77,518	
Returned to shipper	394	
Contraband destroyed	1,126	
Total		
Arriving by land—express, freight, wagon, etc..		
Passed	523	
Treated and passed	253	
Returned to shipper	1	
Contraband destroyed	0	
Total		777
Arriving by mail:		
Passed	190¾	
Treated and passed	8	
Returned to shipper	7	
Contraband destroyed	5¼	
Total		511
GRAND TOTAL OF PARCELS INSPECTED		143,476
Number of parcels on hand pending determination as to final disposition		11

DEPARTMENT OF CITRUS CANKER ERADICATION

Report on Eradication Work in Cooperation with the Bureau of Plant Industry, United States Department of Agriculture, for Month of March, 1928

Citrus grove trees inspected 1,555,581
Citrus nursery trees inspected 0
Inspectors employed on citrus canker eradication 35
New properties showing active infection 0
Total properties showing active infection 0
Grove trees found infected 0
Nursery trees found infected 0
Counties in which active infections were found 0

General Summary

Florida counties in which canker has been found 26
Grove trees found infected since May, 1914 15,243
Nursery trees found infected since May, 1914 342,260
Number properties found infected to March 31, 1928 515
Properties declared no longer danger centers 512
Properties still classed as actively infected, March 31, 1928 3

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to March 31, 1928:

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Tot'l
1914	....	....	....	....	108	160	275	1313	767	565	773	366	4327
1915	306	165	444	408	1042	772	651	1345	618	214	494	256	6715
1916	86	21	49	49	338	450	349	219	124	451	131	27	2294
1917	14	4	9	169	52	45	39	30	6	2	1	1	372
1918	0	1	1	2	1	10	0	0	0	0	0	0	15
1919	0	0	1	1	1	0	0	1	0	0	0	0	4
1920	0	0	0	0	0	0	539	1	0	0	0	0	540
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	585	168	28	34	23	19	12	4	873
1923	1	1	2	3	2	1	0	0	0	1	0	0	11
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	5	0	0	0	0	0	0	0	0	0	5
1926	0	0	0	0	0	0	0	0	0	0	0	2	2
1927	0	0	0	0	0	0	0	0	0	0	85	0	85
1928	0	0	0	....	....	....	....	....	....	....	....	....	....

THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII May, 1928 No. 11

RESEARCH WORK IN FUMIGATION

By A. F. Camp,

Associate Horticulturist, Florida Agricultural Experiment Station

The speakers who have preceded me have ably depicted the activities of the State Plant Board, as it protects the horticultural interests of the state from various pests and troubles. The Plant Board may be likened to the regular army which goes about its business of preparing for the great battles of the future by planning, studying and practicing upon theoretical problems while it is occupied by the more or less regular duty of suppressing petty troubles that arise in the routine of every day existence. It must function quietly and efficiently during the years of comparative peace and be ready to respond brilliantly and swiftly upon the occasion of a great crisis when our industry is in immediate danger. Perhaps in this connection it might be well to recall the lines of Kipling's Tommy Atkins of the British Army and remember that the morale in emergencies is built in peace:

> "For it's Tommy this, an' Tommy that, an'
>   'Chuck him out, the brute!'
> But it's 'Saviour of 'is country,' when the
>   Guns begin to shoot;"

In the carrying out of its routine duties and in its preparations for the battles of tomorrow the army which protects your interests has but few weapons with which to combat the enemy. The soldiers of this army may *inspect* incoming materials and endeavor to *intercept* any unwelcome travelers. This is done at the ports and in the nurseries by experienced men who are trained to recognize insect and fungous enemies. In order to simplify matters at the ports travelers are prohibited from bringing in certain fruits and the inspection consists primarily

*Paper presented at the forty-first annual meeting of the Florida State Horticultural Society, held at Winter Haven, Florida, April 10, 11 and 12, 1928. This paper was the final one presented at the session on the morning of the 12th, which was given under the heading "Plant Protection Symposium." The other papers in this group were published in our April issue.

in intercepting such fruits and confiscating them. In the nursery or grove, inspection may be supplemented by sprays or washes and, in the case of canker, by fire. At the ports another weapon is made use of to combat enemy pests that would gain entrance through shipments of fruits or vegetables. This weapon is fumigation. Thus, in two hours, a ship load of bananas may be fumigated by one man using a deadly poison—hydrocyanic acid—whereas it would have taken several men many hours to examine each bunch of bananas separately for insect enemies. Just imagine yourself confronted with the necessity of examining the 10,000 bunches of bananas that even a very small ship may bring, knowing that every bunch may contain the potentialities of tremendous damage to the citrus industry. Fumigation thus becomes the analogue of the heavy artillery in our coastal defense; for with a single shot we may purge great quantities of material of the insects contained therein.

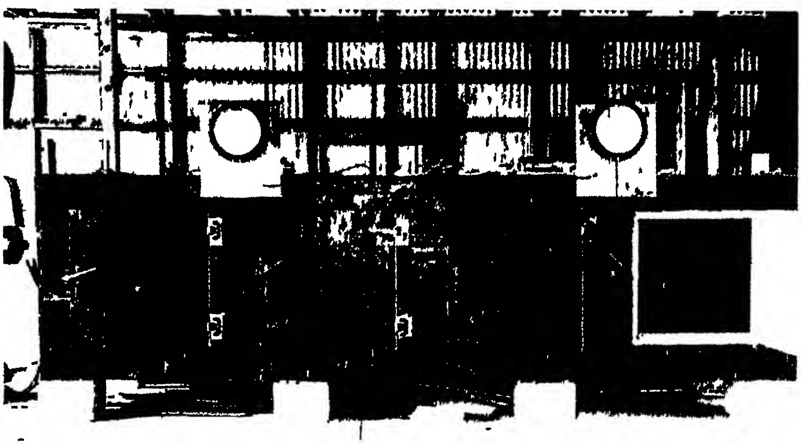

Fig. 1.—Front view of battery of atmospheric fumigation chambers.

While the Plant Board, in a general way, is not a research organization, there are times nevertheless when it is confronted with problems whose solution bears directly and particularly upon the work in hand. One such problem is citrus canker, for success in handling this disease in a crisis is most likely to be dependent upon the information available. For this reason the Plant Board feels compelled to carry on research upon citrus canker in order to make its work more sure. A similar situation has confronted it with regard to fumigation. Here is a problem

which is peculiarly a problem of the Plant Board organization for fumigation is one of its important weapons. In studying the literature on fumigation with an eye to improving present methods, it was found that the literature was far from complete and that many seeming contradictions remained to be explained. It would therefore appear that here is one of the fields in which the Plant Board is justified in carrying out investigations of a research nature.

It is with this in mind that the State Plant Board has undertaken a detailed study of the subject of fumigation in order that it may improve the efficiency of this weapon. In doing this it is looking forward to the time when the pressure exerted upon the mechanism of port inspection in particular will be far greater than it is today. In going into this work it has provided equipment as adequate as we know how to make it at the present time. At least a portion of it is not duplicated, as far as we know, in any other laboratory in this country, having been designed for our particular needs. The work is being carried on cooperatively by the State Plant Board and the Agricultural Experiment Station and out of it we expect to obtain a body of fundamental information that will be useful for all time and be a basis for the solution of new and now undreamed of problems.

Fumigation usually implies the killing of insects or other animal life through the use of poisonous gases and for this purpose many poisons have been used. Fumigation may be used to free any closed space, such as houses or rooms, of insects, in which case relatively high concentrations of gas are used. Frequently it is used to kill insects on live plant materials, in which case the concentration is limited to one which will not injure the plants. Unfortunately our efficient fumigating gases will injure plants if used in the concentrations that would be desirable for insect killing if no plants were present. It is inherent in the very nature of things that a gas that is very injurious to animal life is at least to some extent damaging to plant life. Therefore, the question of plant fumigation is at best only a compromise and often results disastrously to the plants that are being fumigated, as it is impossible with our present information to always know whether plants will be injured or not.

The gas having the most general application in fumigation at the present time is hydrocyanic acid. You are all more or less familiar with cyanide fumigation but it may not be amiss to

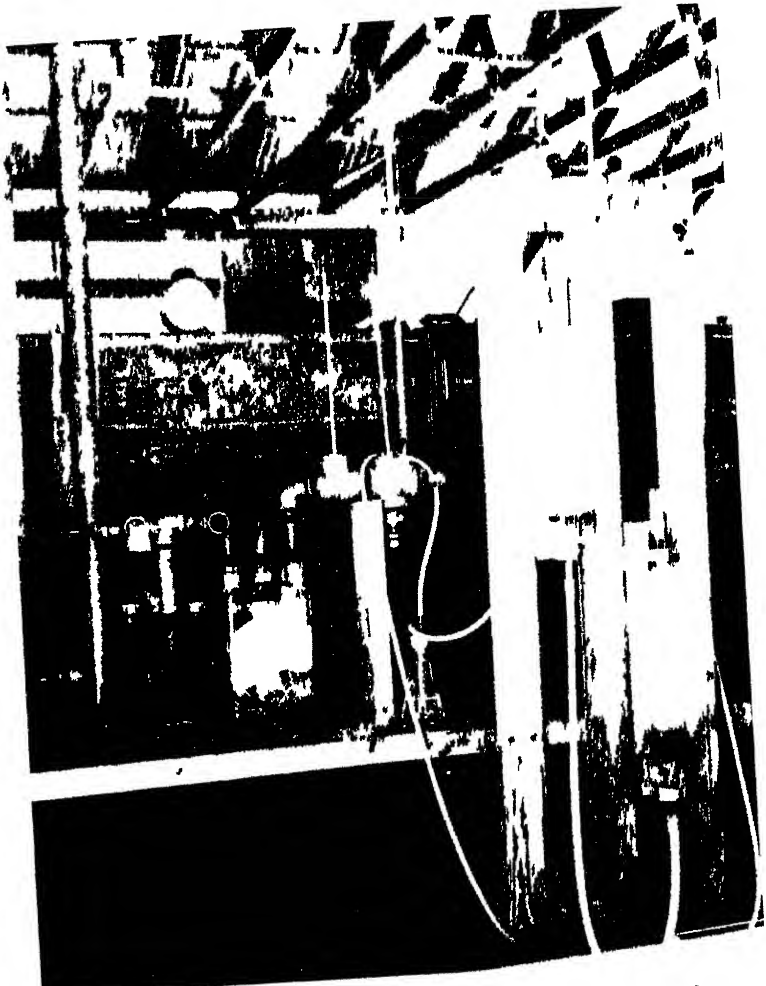

Fig 2—Injecting and sampling apparatus on back of atmospheric fumigation chamber

call some of the characteristics of hydrocyanic acid to your attention. Hydrocyanic acid at ordinary temperatures is a colorless gas somewhat lighter than air This gas can easily be converted into a straw colored liquid by the judicious use of pressure and cold and when in this condition it can be transported and handled with considerable ease though it boils at 79°F. when not under pressure Hydrocyanic acid gas was formerly generated for fumigation by the use of sodium or potassium cyanide

and a solution of sulphuric acid in water, using a crock or keg as a container for the reaction. For several years now the gas has been generated at a central plant and liquefied, the liquid being easily transported in cylinders and measured out for use at the job. Recently calcium cyanide dust has been developed. This dust when spread upon the floor gives off fumes of hydrocyanic acid fairly rapidly and due to the ease with which it is handled has been quite widely used. For experimental purposes, however, the liquid is most easily handled and it is also used extensively for grove and general fumigation in California and elsewhere. In addition to hydrocyanic acid itself, a number of its derivatives have been developed in the last few years but so far none of these have been outstanding successes where plants were concerned since they burned the plants in many instances even more severely than did the hydrocyanic acid gas when insect killing concentrations were used.

Carbon bisulphide has been used considerably for fumigation during the last few years, though its field of applicability is much narrower than that of hydrocyanic acid. Carbon bisulphide is a colorless liquid with a pronounced odor which is rather unpleasant. It boils at about 115 F. and for fumigation it is usually vaporized by means of heat. Its use has been largely restricted to equipment especially designed for this purpose. When the gas is mixed with air it is highly explosive and this fact has very greatly restricted its use. It has a considerable application in the fumigation of food stuff under vacuum. It has one advantage in that it is easily smelled and except for its explosive qualities is relatively less dangerous to human beings than hydrocyanic acid.

A number of other fumigants have been employed such as ether, formaldehyde, etc., but they are all of very limited applicability unless further research points out new methods of application.

Fumigation has two different phases. The first is designated as atmospheric fumigation in that the fumigant such as hydrocyanic acid is merely added to the air in a closed chamber and allowed to diffuse through the material in the room and at ordinary air pressure. The second type which is being extensively developed at present is vacuum fumigation. In this type of fumigation a chamber of heavy steel is used which can be closed up to form a vacuum tight container. The air is removed from this

chamber by means of a large vacuum pump and when the vacuum has been established the gas is allowed to enter the chamber

Fig. 3—General view of back of battery of atmospheric fumigation boxes showing pumps, sampling apparatus, etc.

with a small amount of air so that it permeates all the spaces of the material within the chamber. After all of the charge has been allowed to enter, the remainder of the vacuum is relieved with ordinary air or, if an explosive gas is used, with carbon dioxide, and the material allowed to stand for the usual period of fumigation. This method has the advantage of increasing the penetration in closely packed material such as dried dates, balled roots of nursery stock, etc. As a general method it holds great promise but the expense of preparing equipment for this method is very high and its superiority over atmospheric fumigation will have to be proven conclusively before we can expect to see it adopted generally.

So far we have been mainly occupied at the laboratory with the study of hydrocyanic acid and it will probably occupy us for some time to come. The problems connected with the use of this gas are varied and in order to indicate something of the breadth of the work will be briefly considered at this point. Hydrocyanic acid is very deadly to animals and is also dangerous to plant life. The primary factor governing this appears to be the concentration and our ability to use this gas for the fumigation of plant materials comes from the fact that plants are relatively less sensitive to it than animals. Thus we can use a concentration that will not injure the plants but which will kill most insects. It frequently happens, however, that plants are severely injured by what our past experience would indicate as a safe dosage, or, conversely, that the insects are not killed by what we suppose to be an adequate dosage for this purpose. These conditions are most probably explainable as due to the influence of some of the other factors which will now be considered. *Duration* of the period of exposure is, of course, closely allied to concentration but its exact relationship is not entirely clear, particularly with regard to plants. *Temperature* is a very vital factor for it has a profound effect upon all chemical reactions and it is presumed that the burning of plants by hydrocyanic acid is largely chemical in nature. *Humidity* and *free moisture on the plant surfaces* are both factors that are of major importance but to just what extent is not known and the fundamental problems connected with this phase have hardly been touched upon in research work so far. Pressure is a vital factor in determining the rate of a chemical reaction but to what extent it may influence either the killing of insects or the burning of plants

within the range of ordinary atmospheric pressure in Florida is problematical. Another phase of the question of pressure is involved in vacuum fumigation. The study of the relation of the physiological condition of the plants and insects to the results of fumigation represents a problem that becomes more complex as it it studied. It is commonly understood that young growth on plants is more susceptible to burning than mature growth, but in carrying on experiments how can we define a condition of growth so that it can be duplicated in future experiments? No two plants are exactly alike either in composition or condition and this calls for a very careful study of the plant at all stages of growth and a great deal of statistical work in interpreting results. This variability in the plant or insect material makes it extremely difficult to study the effects of variations in concentration, temperature, etc., for we are often puzzled to know whether a result is due to the variations in the factor we are studying or variation in the organisms used.

The question of the condition of an insect as influencing its

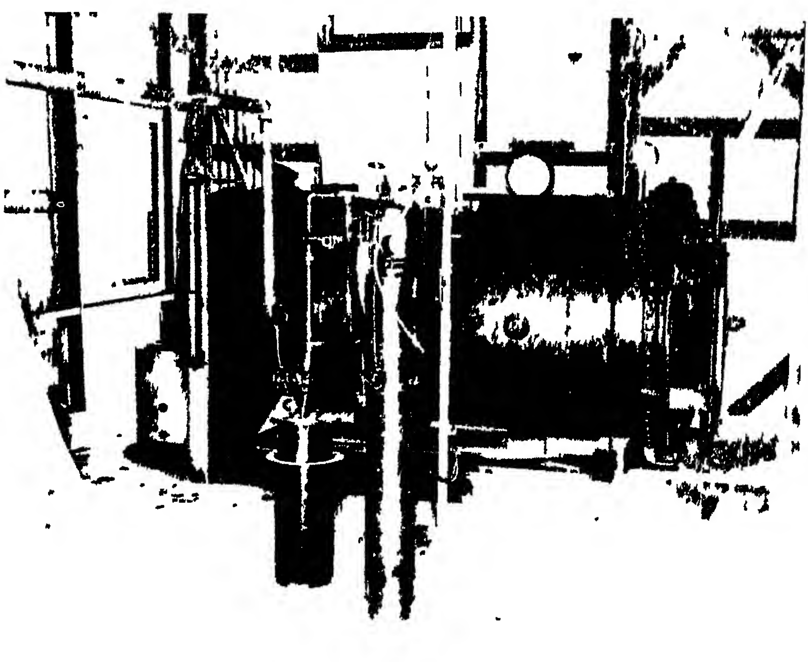

Fig. 4.—Vacuum fumigation outfit, side view, showing charging apparatus in foreground.

resistance to fumigation is likewise important. It is well known that at certain temperatures insects may become more or less quiescent, this state being termed hibernation under certain conditions, and it is quite likely that respirational activity is greatly reduced at such times together with a reduction in the efficiency of fumigation. When an insect is within a fruit the fumigant is largely excluded and if the insect is in the pupal stage its activities are likewise at a low ebb. Very careful studies will have to be carried out to determine the relationship of fumigation to the stages in insect life history.

In the carrying out of scientific experiments it is comparatively easy to analyze the effect of one factor or even of two interrelated factors where the effect of other factors can be eliminated. When, however, we must study several factors, all of which are closely interrelated, the problem is in a state where research is particularly trying. If we could say in practice that all fumigation should be carried out under like conditions of temperature, moisture, pressure and plant condition, it would be comparatively easy to establish the effect of concentration and duration of exposure. However, the temperature, humidity, plant condition and pressure, as well as the physiological condition of the insect itself, vary with every fumigation so that the problem becomes one of great complication. This accounts for much of the uncertainty which has been coupled with the problem of fumigation. It likewise explains the reason for the complicated apparatus used in our experiments, in which so many different factors are controlled. It is not sufficient to work out one set of conditions and say that for this temperature, concentration, duration, pressure and what not, we can expect a certain result for we may never duplicate in practice this particular set of conditions. We must be able eventually to frame general rules which will enable us to predict what will happen at any temperature, concentration, pressure, etc. We cannot say to the man who has a shipload of bananas to fumigate that the temperature must be 70 F., the relative humidity 60%, the pressure 31 inches of mercury, the fruit of such and such a degree of ripeness and all insects in the mature state. Rather, we must furnish him with information that will enable him to know what to do in the face of the conditions that prevail on the boat at the time when the fumigation must be done.

This brings us to another phase of the problem that we have

Fig. 5.—Vacuum fumigator, front view, showing structure of heavy door and with charging apparatus to the left.

been working upon. Hydrocyanic acid gas is very highly reactive and sometimes unstable, and has a way of disappearing when certain substances are present. Most of the work done on fumigation has been based upon the dosage applied, i. e., so many ounces of sodium cyanide per hundred cubic feet, or so many cubic centimeters of liquid hydrocyanic acid, experiments being commonly reported upon such a basis. That is to say, one man fumigates a greenhouse and reports on the basis of so many ounces per 100 cubic feet and another fumigates a tight chamber and reports on the same basis, though we know that the actual concentrations within the two fumigated spaces would vary widely due to leakage in the greenhouse. Very little work has been done in which the gas concentration within the fumigated space has been actually determined, though this is fundamental to the solution of the problem.

This lack of information leads to apparently contradictory statements in the literature. For instance, two men studied the fumigation of tomato plants, one in a tight room and one in a greenhouse. The man who studied fumigation in a room said that wetting the plants was a sure way to cause burning, the other advised wetting down the plants as a sure way of preventing burning, and both of them were presumably honest, able men. In studying the behaviour of hydrocyanic acid in a vacuum bulb, especially designed and blown for the purpose in our laboratory, we found that hydrocyanic acid had an enor-

mous affinity (if I may use the term) for water and acids as well as alkalis. If the inside of the bulb was wetted with water before the gas was admitted much of the gas disappeared almost instantly. The interpretation of the two papers was then apparent. In the case of the man using the room for fumigation the plants alone were wetted so that when the gas was admitted to the room it concentrated in the water on the surface of the plants. In the case of the greenhouse experiments the soil in the bench, the floor and even the walls were wetted freely, as well as the plants, before the charge was put in so that the gas had a great deal of water to dissolve in and the concentration in the water on the leaves was correspondingly low. In the first case burning resulted from the concentrated solution on the plants, because there was only a small amount of hydrocyanic acid in the water on the plants. In the second case no burning resulted.

The great reactivity of hydrocyanic acid results in a decrease in the efficiency of diffusion particularly through small spaces. Suppose you have a barrel full of potatoes and you put a charge of hydrocyanic acid in the air above them. If the potatoes are damp the hydrocyanic acid will be absorbed by the surfaces of the top potatoes and only a very little of the gas will reach the bottom of the barrel. Thus we must study the relation of surface to absorption and diffusion, for here are two important variables. Place one small plant in a chamber and fumigate it, analyzing the gas in the chamber several times during the duration of the fumigation, and you will find that the concentration is quite high throughout the period of fumigation. But fill the same chamber with closely packed material and the concentration in the air falls off with great rapidity—particularly if the material is damp—but how fast and under what conditions? That is for us to determine.

Turning now to the equipment itself, we have in figure 1 a front view of the battery of four chambers for atmospheric fumigation. This battery of chambers was made with the greatest care, of high grade flooring, with all joints leaded and with two layers of asphalt building paper between the double walls—a standard construction for such boxes. It was found on analyzing samples of gas that in spite of the careful construction there was a great amount of leakage together with absorption of the gas by the paint used on the inner surfaces. The chambers finally had to be coated internally with a thick layer of hard paraf-

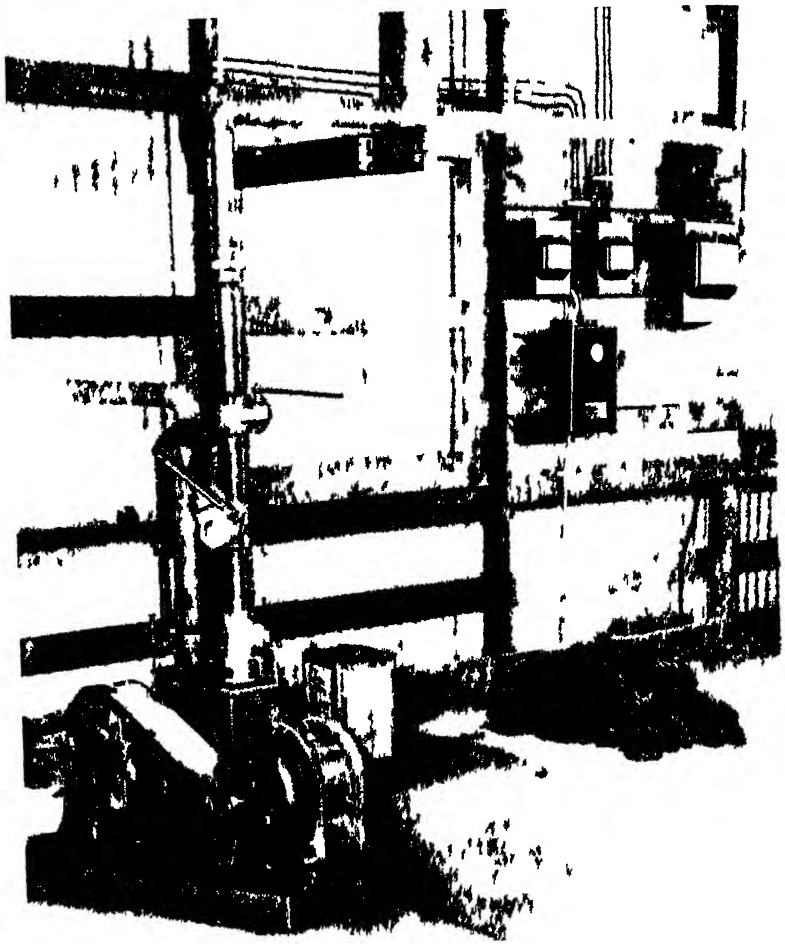

Fig 6—Vacuum pump used to evacuate tank in vacuum fumigator

fin to stop this loss. The doors are of the same construction as the boxes and rubber tubing is used to prevent leakage around them. Each chamber has an automatically controlled heating coil and the bulb of a recording thermometer is sealed into the top. An 8 inch fan is used to agitate the air during the course of experiments so as to keep the temperature and gas concentration constant. These boxes are about as near to being gas tight as it is possible to build them. On the back of each box is the complicated unit shown in figure 2. On the left is an air pump

that draws air out of the box, and passes it through sulphuric acid or other solution in the large bottle for removing or adding water vapor, from which it passes through a collecting trap which is back of the bottle and which catches any acid spray that gets out of the large bottle. The gas then enters a manifold that returns it to the fumigation chamber; in this manifold are two thermometers, one with a wet and one with a dry bulb, and with these the humidity is determined. In the same manifold is a burette which is used to measure out the proper amount of liquid hydrocyanic acid. On the right is a sampling apparatus which is used to draw accurately measured samples of the air and gas mixture out of the inside of the chamber, the hydrocyanic acid being trapped in concentrated caustic alkali in the small flask as the air is pulled through it. In figure 3 is shown the general view on the back of the battery of boxes. So far it has been impossible to find a satisfactory substance for controlling the humidity that will not absorb hydrocyanic acid so that the humidity desired has to be established before the experiment is started and allowed to take care of itself during the course of the experiment. We hope, however, to remedy this with more experimental work.

In figure 4 is shown the vacuum fumigator. The chamber in which the material is placed is a large steel tank with a heavy door which has a rubber gasket under it and which can be made air tight. The line of pipe running overhead to the left goes to the large vacuum pump and the complicated apparatus in the foreground is used for charging the tank with hydrocyanic acid or carbon bisulphide. Back of the large tank is seen the recording thermometer which records the temperature within the fumigation chamber. In figure 5 is a front view of the same equipment showing the details of the door and charging equipment. The hydrocyanic acid is kept in the cylinder to the extreme left. Note the pump used for forcing the liquid out of the cylinder. The cylinder is connected to the measuring tube where the sample is measured out and then drawn into the evacuated tank through a vaporizing nozzle. A generator for hydrocyanic acid gas is also provided in case none of the liquid is available, and can be seen just to the right of the cylinder containing the liquid. The cylinder next to the post is a vaporizer for carbon bisulphide, the remainder of the carbon bisulphide apparatus being disconnected. In figure 6 is the large vacuum

pump which is used to withdraw the air from the chamber. Such apparatus is being used extensively for fumigation in California and also for fumigating baled cotton in Texas. The tanks are made large enough to admit a freight car and may come into general use when they have been studied more thoroughly.

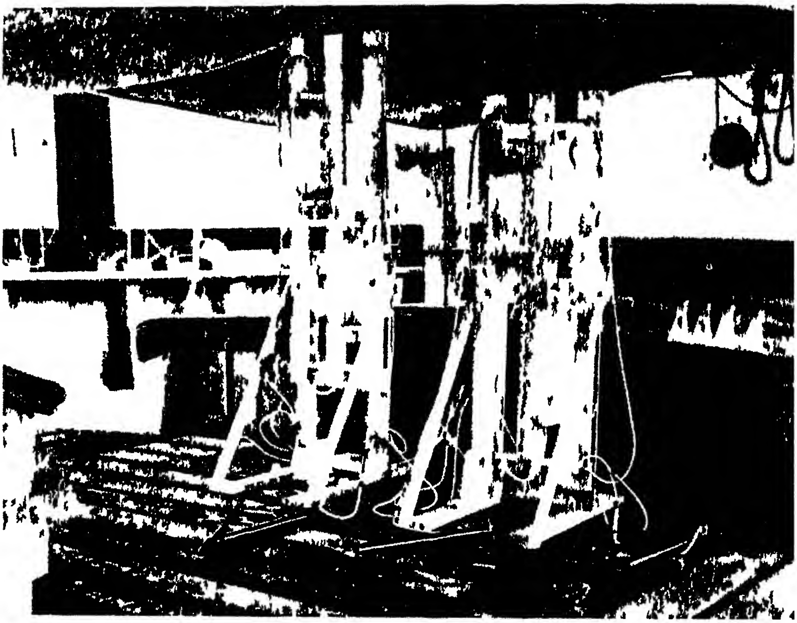

Fig. 7.—Sampling apparatus set up on shipboard for sampling during fumigation of bananas.

In figure 7 is shown the sampling apparatus as used on shipboard. The sampling bulbs are the same as those seen in figure 2 on the back of the fumigation compartments in the laboratory. Samples of the air are drawn out and analyzed during the actual period of fumigation. Tubes are installed in the boat so that the samples may be withdrawn from various points to determine the uniformity of distribution and the actual concentration throughout the period of fumigation. Thus we do not have merely information on what *was added* but information as to *what was there.*

In conclusion I want to impress this upon you: that this work is not primarily for the solution of immediate question or to straighten out the little troubles that come up from time to time. Too often that kind of research is only a little salve on a fester-

ing canker which should really be removed root and branch. If we adhere to that kind of research in the end we face the difficult problems with only tag ends of knowledge instead of a broad, comprehensive understanding of the principles involved. This work is primarily to study those basic principles and to lay the foundation for the solving of difficulties that we are certain to face in the future. By the aid of this mass of basic knowledge we will be able to meet the new and unforeseen difficulties as they arise and meet them intelligently. We are not studying *grove fumigation or ship fumigation;* we are studying *fumigation* and the information will be applicable to all types and varieties of fumigation.

FRIENDLY FUNGI HELP CITRUS GROWERS†

FUNGUS PARASITES REDUCE PEST CONTROL COSTS

By J. Francis Cooper[1]

Realizing that most of the important pests of farm crops have enemies that prey on them, Florida investigators are always trying to find some natural means of controlling insects and diseases to avoid the necessity of spraying and dusting, or to lessen the amount of these artificial means of control that is required. Fortunately, natural enemies have been found for many of the important citrus insects, and methods have been worked out for their distribution in the grove.

Whiteflies and scale-insects are among the most serious insect pests of citrus in Florida. However, there are a number of friendly fungi (called entomogenous fungi) which prey on whiteflies and scale-insects and aid greatly in keeping them under control.

Among the principal fungus parasites of whiteflies in Florida are the Red Whitefly-Fungus, Yellow Whitefly-Fungus, Brown Whitefly-Fungus, White Fringe-Fungus and Cinnamon Fungus. Among the enemies of scale-insects are the Red-Headed Scale-Fungus, the Pink Scale-Fungus (which effectively destroys the Florida Red Scale), the White-Headed Scale-Fungus, the Black Scale-Fungus, the Turbinate Fungus, the Cuban Aschersonia,

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†Reprinted from The Florida Grower.

[1]Editor, The Agricultural News Service, College of Agriculture, University of Florida.

the Cephalosporium Fungus, and the Cottony-Cushion Scale-Fungus.

The Red Whitefly-Fungus (Red Aschersonia), Yellow Whitefly-Fungus (Yellow Aschersonia), White Fringe-Fungus, Cephalosporium Fungus and the Cottony-Cushion Scale-Fungus can be grown artificially on sterilized sweet potato plugs with agar. Each year the State Plant Board grows a large number of cultures of some of these fungi for distribution among growers of the state.

All of these fungi may be spread in the grove by mixing the material contained in a culture with 50 to 100 gallons of water and spraying the trees. The spores of the fungi lodge, and when they germinate they attack whiteflies or scales. Another method of disseminating them in a grove is by tying fungus material collected from insect-infested trees to other trees infested with the insect pest of which a particular fungus is the natural enemy. The fungi are generally spread in the grove during the rainy season of summer.

While these friendly fungi will not always eliminate the necessity of spraying, they do reduce the number of times that spraying is required, and amount to a saving of expense to Florida citrus growers estimated at well over a million dollars a year.

The Entomology Department of the State Plant Board announces that it again has a fine lot of whitefly fungus, principally the Red Aschersonia, available for distribution. The price is now $1.00 per culture, with directions, and transportation charges prepaid by the Board. A culture consists of the amount of fungus that can conveniently be grown in a pint wide-mouthed bottle and is sufficient for about an acre of trees.

THE MONTHLY BULLETIN

State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

WILMON NEWELL, *Plant Commissioner*..*Editor*

ASSOCIATE EDITORS

E. W. BERGER..*Entomologist*
J. C. GOODWIN..*Nursery Inspector*
J. H. MONTGOMERY ....*Quarantine Inspector*
....*Plant Pathologist*

Entered as second-class matter November 14, 1916, at the postoffice at Gainesville, Florida, under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 10, 1918.

DEPARTMENT REPORTS

NURSERY INSPECTION DEPARTMENT

NURSERY INSPECTOR'S SUMMARY FOR MONTH ENDING APRIL 30, 1928

Number of nurseries inspected		895
Quantity of stock inspected:		
Citrus	8,934,717	
Non-citrus	11,636,513	
Total		20,571,230

BEE DISEASE ERADICATION

REPORT FOR MONTH OF APRIL, 1928

Number of apiaries inspected	70
Number of colonies inspected	1,212
Number of apiaries infected with American foulbrood	3
Number of colonies infected with American foulbrood	13
Number of colonies destroyed	13
Number of apiaries infected with European foulbrood	1
Number of colonies infected with European foulbrood	1
Number of colonies treated	1

QUARANTINE DEPARTMENT

Quarantine Inspector's Monthly Summary
April, 1928

Ships and Vessels Inspected:			
From Foreign Ports:			
Direct	266		
Via U. S. Ports	56		
Total		322	
From U. S. Ports other than Florida		169	
From Florida Ports		63	
Total			554
Number of Parcels Inspected:			
Arriving by water:			
Passed		166,571	
Treated and passed		147,238	
Returned to shipper		272	
Contraband destroyed		435	
Total			314,516
Arriving by land—express, freight, wagon, etc.:			
Passed		1,504	
Treated and passed		302	
Returned to shipper		57	
Contraband destroyed		2	
Total			1,865
Arriving by mail:			
Passed		383	
Treated and passed		4	
Returned to shipper		0	
Contraband destroyed		3	
Total			390
Grand Total of Parcels Inspected			316,771
Number of parcels on hand pending determination as to final disposition			4

DEPARTMENT OF CITRUS CANKER ERADICATION

Report on Eradication Work in Cooperation with the Bureau of Plant Industry, United States Department of Agriculture, for Month of April, 1928

Citrus grove trees inspected	944,489
Citrus nursery trees inspected	0
Inspectors employed on citrus canker eradication	35
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

General Summary

Florida counties in which canker has been found	26
Grove trees found infected since May, 1914	15,243
Nursery trees found infected since May, 1914	342,260
Number properties found infected to April 30, 1928	515
Properties declared no longer danger centers	512
Properties still classed as actively infected, April 30, 1928	3

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to April 30, 1928:

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Tot'l
1914	...	.	......	.. .	108	160	275	1313	767	565	773	366	4327
1915	306	165	444	408	1042	772	651	1345	618	214	494	256	6715
1916	86	21	49	49	338	450	349	219	124	451	131	27	2294
1917	14	4	9	169	52	15	39	30	6	2	1	1	372
1918	0	1	1	2	1	10	0	0	0	0	0	0	15
1919	0	0	1	1	1	0	0	1	0	0	0	0	4
1920	0	0	0	0	0	0	539	1	0	0	0	0	540
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	585	168	28	34	23	19	12	4	873
1923	1	1	2	3	2	1	0	0	0	1	0	0	11
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	5	0	0	0	0	0	0	0	0	0	5
1926	0	0	0	0	0	0	0	0	0	0	0	2	2
1927	0	0	0	0	0	0	0	0	0	0	85	0	85
1928	0	0	0	0	......	......	.....	......	......	......	......	......	......

PUBLICATIONS WANTED BY THE STATE PLANT BOARD

Revista de Agricultura de Puerto Rico (San Juan)

Vol. I (1918) No. 3. Vol. II ( ) No. 1.

Vol. III (1919) No. 5. Vol. VI (1921) Nos. 1, 6.

Vol. VIII (1922) No. 5.

Institute of Jamaica
Journal—Vol. I.

Societe Entomologique de France (Paris)
Annales et Bulletin. 1832-1857

Philippine Journal of Science (Manila)

Vol. III, Sect. A, No. 6. (1908)

Vol. VI, Sect. A, No. 2. (1911)
Sect. C, Nos. 1, 3.
Sect. D, Nos. 2, 5, 6.

Vol. VII, Sect. B, Nos. 1, 2, 3, 4. (1912)
Sect. C, No. 2.
Sect. D, No. 3.

Vol. IX, Sect. A, Nos. 2, 5. (1914)

Vol. XIV, Complete (1919)

Philadelphia Academy of Natural Sciences
Proceedings, Vols. 2, 6, 7.

Missouri. Reports of State Entomologist (Riley)
Reports Nos. 8, 9, Index

Buffalo Society Natural Sciences.

Vols. IV-X (1881———)

Those having any of the above for sale please advise. State price in your communication.

Library, State Plant Board,
Gainesville, Florida.

THE MONTHLY BULLETIN

State Plant Board of Florida

Vol. XII June, 1928 No. 12

NOTICE OF PUBLIC HEARING

Tallahassee, Florida,
June 11, 1928.

Notice is hereby given that the State Plant Board of Florida will hold a public hearing in Room 301, Horticultural Building, University of Florida, Gainesville, Florida, on July 9, 1928, at 9:00 A. M., at which time and place consideration will be given by the Board to the advisability of amending or repealing Rules 7A, 7B, 7C and 34, which rules pertain to the shipment into and within the state of sweet potatoes, tubers and plants, and of related plants such as morning-glories. All persons interested are invited to be present, either in person or by attorney.

J. T. DIAMOND, Secretary.

P. K. YONGE, Chairman.

BOARD TO CONSIDER RULES APPLYING TO SHIPMENT OF SWEET POTATO TUBERS AND PLANTS

The Notice of Public Hearing published above was authorized by the State Plant Board at its regular monthly meeting held at Jacksonville on June 11, 1928. The action of the Board followed the submission of a recommendation by the Plant Commissioner which is here quoted:

> "The Plant Commissioner recommends that the Board give consideration to the advisability of revising or abrogating certain rules of the Board pertaining to the shipment into and movement within the state of sweet potatoes and sweet potato plants. These rules are Nos. 7A, 7B, 7C (intrastate) and No. 34 (interstate). These rules were originally adopted upon the discovery that the sweet potato weevil constituted a serious menace to the sweet potato industry in the state and were intended for the purpose of retarding as far as possible the spread. The Plant Commissioner's recommendation is based upon the fact that observations during the last several years indicate that the weevil has steadily spread despite the efforts of the Board. The difficulties in applying the regulations under present conditions governing movement by truck over good highways make it almost impossible to apply such regulations effectively. The Plant Commissioner is further actuated in making this recommendation through the fact that during the period since these rules have been in effect the United States Department of Agriculture, cooperating with the State Plant Board of Florida, has developed a method through the use of which sweet potatoes may be produced commercially even with the presence of the weevil. In view of these circumstances, it is suggested that the Board revise or abrogate the rules above referred to and that consideration be given to this action at the July Board meeting, public notice of such consideration to be given through the Monthly Bulletin."

THE MONTHLY BULLETIN

State Plant Board of Florida

INVESTIGATION OF MEXICAN FRUIT FLY (ANASTREPHA LUDENS LOEW) IN MEXICO

By Dr. David L. Crawford, Entomologist

Editorial Note So much interest has been manifested by readers of The Monthly Bulletin in the fruit fly menace that we are this month printing an article on the Mexican fruit fly by Dr. D. L. Crawford, now President of the University of Hawaii. This paper was first printed in the Monthly Bulletin of the California Department of Agriculture. We are indebted to the California Department for the privilege of reprinting.

INTRODUCTION

Although the Mexican orange fruit fly *(Anastrepha ludens* Loew), or orange maggot, is not known to be present in California or Florida, this insect pest is nevertheless of great interest to the southern states because of its proximity and because of the alarm and apprehension which it has caused horticulturists in the United States. A quarantine has been maintained for some years by California against this pest, and on January 15, 1913, the federal government enacted a strict quarantine for the United States on Mexican host fruits. Heretofore, the information published concerning this Mexican pest has been the result of brief trips through parts of the country, and a really thorough knowledge of the subject from longer studies has been lacking. It is the purpose of this article to supply more extensive information as a result of having studied this insect throughout the entire year.

The investigational work, of which the following is a report, was carried on in eastern Mexico, from May, 1913, to May, 1914, under the combined auspices of the Mexico Gulf Coast Citrus Fruit Association, the National Railways of Mexico, and the Mexican federal government. The work was not completed—in fact, it was only well started—at the time when the American occupation of Vera Cruz made a continuation of studies impossible. Although the work is incomplete, the results obtained in the year of study are of value, since this knowledge will serve as a practical basis for further work. This is the first time that

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Dr. Crawford, who is now president of the University of Hawaii, made this investigation in Mexico in 1913 and 1914. This manuscript had never been published before its publication in the Monthly Bulletin of the California Department of Agriculture.

the investigations have been made in one region throughout an entire year.

DISTRIBUTION

In a general way it may be said that the Mexican orange fruit fly is distributed over, and limited to, the southern half of Mexico, reaching somewhat farther north on the east coast than on the west coast. Exact data as to which areas of this southern half are infested and which are not, is not yet available, but it is certain that there are parts of the southern half which are free from the pest.

Central America and northern South America, also, harbor this fruit fly in certain areas.

The most careful inspections which have been made thus far show the insect present a little north of 25 degrees north latitude, at Montemorelos, Nuevo Leon, reaching this parallel only on the east coast. The infestation north of 24 degrees is relatively slight and only sporadic. Westward, toward the center of the country, the northern limit of infestation is about 19 degrees north latitude, while on the Pacific slope the twentieth parallel marks the northern limit of distribution. It will be seen that all the great northern half of the country is free from the insect, and this in spite of the frequent and continued shipping of fruit from the south. The reason is apparently the higher temperatures in the northern regions, since the regions infested seldom have a temperature above 100 degrees, and although there is a scarcity of fruits in some parts of northern Mexico, in other parts there are many host fruits in rapid succession as well as wormy fruit being shipped in; still, at the present time, the orange fruit fly has not become established.

Inspections by entomologists have shown the insect to be present in the southern half the state of Tamaulipas, in the southern part of San Luis Potosi, in Nuevo Leon, in more or less all of the state of Vera Cruz and Morelos, and in parts of Guerrero, Oaxaca, Chiapas, Campeche, and Yucatan. According to less dependable reports, the following places are supposed to be also infested: Parts of the states of Puebla, Mexico, Colima and Michoacan, and perhaps still others in the south. Citrus fruits are grown in almost every part of Mexico except in the highest plateaus and dry deserts.

The areas worst infested by this insect are parts of the small

state of Morelos, south of Mexico City, and parts of the state of Guerrero. In these regions the infestation is sometimes very serious—as much as 50 or 75 per cent of some crops being affected. In Vera Cruz, Tamaulipas, Oaxaca and Chiapas the average percentage is seldom over 5 to 10 per cent and some years less than that. One of the very important phases of the study of this fruit fly left for the future is a more detailed and complete inspection of the country to more definitely ascertain its distribution. This is important, not only for the sake of the information which will become available, but also for turning more light on the relation which ecology has on distribution. Not until this is thoroughly done can our country be assured of the danger or lack of danger, as the case may be, of the introduction of this insect into our southern states. There are, as well, several very interesting scientific problems of ecology and dissemination to solve in this connection. These and the relationships of the insect to high temperatures are discussed in detail under the heads of "Life History and Habits" and "Dissemination."

In January, 1913, the Federal Horticultural Board of the United States Department of Agriculture detailed Mr. T. E. Holloway of the Bureau of Entomology to obtain information concerning the Mexican orange maggot, especially in relation to grapefruit, there being some doubt as to whether this fruit was among the hosts of the insect. Mr. Holloway reared flies of *Anastrepha ludens* from grapefruit collected near Tampico, and found wormy citrus fruit also at Rio Verde (San Luis Potosi) and at Montemorelos (Nuevo Leon).

HOST FRUITS

So far as present knowledge goes, only the following fruits are affected by this pest: Grapefruit *(Citrus decumana)*, sweet orange *(Citrus aurantium)*, sour orange *(Citrus vulgaris)*, bitter orange *(Citrus bigaradia)*, guava *(Psidium guajaba)*, mango *(Mangifera indica)*, wild plum or ciruela *(Spondias purpurea)*, and *Achras sapota*.

Grapefruit seems to be the favorite host fruit, probably because of the thick rind as well as the thick rag within. In localities where grapefruit are ripening, other fruits are very seldom attacked by the fly. It is only after the grapefruit season is over that sweet oranges are attacked. Mangoes in the Gulf region have never been found to contain maggots, while those in Morelos

and other regions of Mexico are often badly infested. The same may be said of guavas in the same two regions. In Morelos it is often difficult to find a guava without maggots of this pest, especially in July and the summer months. Careful search has been made many times in the Gulf region during the same months and at other times, and very few guavas have been found wormy.

Whether or not this insect can be driven to attack other fruits, as the Mediterranean fruit fly *(Ceratitis capitata* Wied.) has been, by too diligently removing host fruits in the effort to starve out the pest, has not yet been ascertained, but there is some evidence to this effect. Some young maggots were taken from grapefruit and placed in a Eureka lemon. The maggots burrowed in without hesitation through the cut surface of the lemon, and lived within for several weeks. Some were seen to come out to the surface occasionally and after a while to re-enter the fruit. Whether or not this would indicate an irritation set up by the fruit acid is not known. Most of the larvae grew to maturity, pupated and later produced adult flies, thus indicating that larvae "can live and thrive in the fruit." However, flies have never been seen to rest on lemon trees or the fruit, and a wormy lemon or wormy sour lime has not been found.

It has often been said that a series of different kinds of fruits is necessary that this fruit fly may live and thrive. Mangoes and guavas must fill in gaps between orange crops, and vice versa. This is not true in all regions. It is certain that citrus fruits in a single orchard can and do maintain the insect throughout the year. The gap between crops is filled in by off-season fruit in small quantities and by green fruit. It has always been said heretofore that green fruit is avoided by the ovipositing female as unfit food for larvae, but it has been established that eggs are deposited in very green grapefruit and that the development of the larvae is long retarded thereby.

ECONOMIC IMPORTANCE

The financial loss, from the enactment of foreign quarantines against Mexican fruits, because of this fruit fly, will increase its economic importance. The loss in wormy and nonsaleable fruit is considerable in some localities at some times of the year, but will not represent the total loss to the country, since to this must be added the loss incurred through inability to ship any

of the quarantined fruits into the United States, which is Mexico's best market.

The actual amount of fruit lost through the ravages of this fruit fly varies with the location from year to year and from season to season, and is not the same for all the host fruits. On the eastern Gulf coast, for example, the loss is usually not more than 5 per cent of the total crop, and sometimes less. Only grapefruit and a few other citrus fruits are attacked to an appreciable extent in this region, and a large number of orchards are free or nearly free from the pest. The infested fruit is approximately 5 per cent of the crop.

In the northern districts the percentage of infestation is still less, and during some years all orchards are practically free of infestation. Still farther north there has been no infestation whatever, and the condition in most of the southeastern portion of the country around Jalapa is somewhat as on the east coast, even a smaller percentage of the fruit being affected. The attacks around Jalapa seem to be more periodic. In the west coast region there is some infestation, but this investigation did not develop to that extent. The region south of Mexico City, in the state of Morelos, has a more serious infestation of this pest and losses may be as great as 50 or 60 per cent of the fruit crop. An average loss of 30 per cent of mangoes, guavas and oranges is probably more nearly within the facts of the case.

SYMPTOMS AND EVIDENCES OF THE PEST

The presence of maggots in fruit can be detected only after the larvae have attained considerable size. During the first and second week after hatching they are very small and their injury to the fruit is not easily visible from the outside. The first external symptom of the presence of maggots is a slight discoloration or a deepening of color in a small part of the rind or skin of the fruit. This becomes more and more pronounced up to the time the maggots mature, when it is quite conspicuously distinct. By this time, the fruit is usually loosened from its stem and drops off at the touch, or in a breeze or eventually by its own weight. Fruit ready to drop off is often entirely a little "off color," and can often be distinguished from sound fruit in this way.

To sort out all wormy fruit from sound fruit in a packing house is impossible, because all wormy fruit does not become dis-

colored, and, furthermore, there may be some containing young maggots which have not made their presence evident. However, it is easily possible to sort out a very large percentage of the wormy fruit if one is acquainted with the work and is a careful observer.

Wormy fruit with mature maggots will show other external evidences. There is usually a softening on one or several spots under which the maggots are working. In citrus fruits this is less marked than in mangoes. In citrus fruits, however, there is usually another conspicuous mark, namely, one or more small holes through the rind, from which juice often drips. The maggots coming to the surface about a week before they emerge, make these holes in the rind. The Mexicans say that all oranges which "cry," have worms—meaning the leaking of juice from these holes. At this stage of infestation the fruit does not last long, soon decaying.

Internal evidences under some conditions are more easily seen than external ones. A very characteristic lesion is found in the rind of citrus fruits, especially grapefruit, if the calyx or stem end of the rind is cut through transversely. The maggots burrow in the rind for several weeks and leave brown, criss-cross, conspicuous galleries throughout a part of the rind. This damage may occur on the side of the fruit, but is usually evident at one or both ends.

Cut the fruit through the middle transversely and one or several sections of the infested orange or grapefruit usually will be abnormal. Either it will have a conspicuous part broken down, or all of it may be thus broken down. The juice sacs are broken and shriveled and the juice is free in the section. It is not the same in appearance as the sections which are sometimes *dried up* by the parasitism of some fungus.

It is possible that a specific gravity test could be applied to fruit in a packing house to distinguish wormy fruit from sound fruit. But this would be no more effective than hand sorting, for the specific gravity of fruit containing very young maggots would not be affected. On the other hand, fruit containing only very small maggots, while unattractive, may not be injurious, as the maggots are in the rind or skin, and are removed in peeling the fruit before eating it. There are undoubtedly a large number of small maggots eaten in apples in northeastern United States.

DESCRIPTION

Fly.—The two-winged fly, or adult stage of *Anastrepha ludens* is somewhat larger than the housefly, and conspicuously banded and colored on both body and wings. The female abdomen is distinguished by the long, slender, tube-like projection in which the ovipositor is concealed. This sheath is as long as the rest of the abdomen, very slender and tapers to a narrow, truncate end. The ovipositor is needlelike and can be exserted a little more than one-eighth of an inch, or about 3 mm.

A closely related species, *Anastrepha fraterculus,* differs from *A. ludens* chiefly in the relative length of the terminal abdominal segment of the male fly. It is probable that some of the existing records of *A. ludens* in reality are those of *A. fraterculus* for both are found in the southern part of North America.

The following descriptions of the stages of the fruit fly are more detailed:

Larva.—The mature larva is whitish, dirty white or yellowish white, depending on the color pigments of the host fruits. They are about 1 cm. in length, sometimes a little longer, but often shorter. The cephalic end is acuminate and pointed. The jaws and head segment are black. The caudal end is truncate broadly, and about 2 mm. thick. The two spiracular plates are brown to dark brown and conspicuous. The body segments are usually distinctly marked, though sometimes the distended condition of the skin renders them indistinct.

Pupa.—The puparia are about 5 to 8 mm. long and 2 to 2.5 mm. thick, rounded broadly at both ends, but more broadly at the caudal end. The color is at first very light brown and gradually darkens by age to a very dark reddish brown, or chocolate brown. The spiracular plates of the larva remain visible on the puparium. The pupa is found normally in the soil beneath and around the previously infested trees.

Adult.—The female is about one centimeter (a little less than half an inch) in length, with a wing expanse of from 17 to 20 mm., or about three-quarters of an inch. The abdominal tube is nearly as long as the thorax and base of abdomen combined (4 to 4.5 mm.). The wings are longer in proportion than those of the housefly, being about 8 mm. long and about 3 mm. wide at the middle. The male is somewhat smaller in all its proportions.

The color of the body in both sexes is a pale orange yellow, with two or three indistinct whitish stripes along the thorax be-

tween the wing bases. The flies blend into the color of a ripe orange, becoming inconspicuous. The eyes are brownish, while the face is a little brighter yellow than the thorax. The legs are of the same color as the thorax and abdomen. The wings are striped and banded with orange yellow, and are transparent between the bands. The basal half is more or less completely colored, with several small clear or slightly colored areas. In the outer half are two more or less V-shaped bands, the V inverted. The smaller V-shaped band is often not completely joined at the apex, as shown in the figures, but this depends very largely upon the age of the individual being examined. When the adult first emerges from the puparium the color of the body and especially of the wings is very pale and the bands of wings are indistinct. It is only after two or three days that the color of the wings is fully developed, and the smaller V-shaped band complete.

The following more detailed description, adapted from that originally published by Loew, will be more useful to entomologists:

"Pale clay-yellow. Front of a somewhat brighter yellow, of a very moderate breadth; the usual frontal bristles black, only the upper ones rather long and strong. The yellow antennae almost as long as the face; arista long and slender, with a very short and delicate pubescence. Oral opening rather large; oral edge rather sharp. Proboscis and palpi yellow, the latter rather broad; the suctorial flaps somewhat prolonged. The upper side of the thorax of a light, bright clay-yellow; a sulphur-yellow middle stripe, gradually vanishing anteriorly, expanding posteriorly in a cuneiform shape, and nowhere well defined; scutellum sulphur-yellow; on each side, above the root of the wings, a well-marked, pale-yellow longitudinal stripe, which runs from the transverse suture to the posterior margin of the thorax; quite on the lateral margin an indistinct but broader pale-yellow stripe; the humeral corner and a well-defined stripe on the upper part of the plurae, reaching to the root of the wings, likewise of a bright pale-yellow. The very short pile on the thorax is yellowish; the usual bristles are black or blackish brown. Scutellum with four black bristles. Metathorax clay-yellow. Abdomen with short yellowish pile and with black bristles on its posterior end; the last segment very much prolonged; much longer than the two preceding ones. Taken together (this character serves easily to distinguish this species from *A. fraterculus*, which is very much like

it). Feet yellow, under side of the front femora with several blackish-brown bristles. Wings not very broad in comparison to their considerable length; the rivulets on them are pale brownish-yellow, with narrow, but little-conspicuous, and not always perceptible brown borders; near the posterior margin and on the apex of the wing they are altogether brownish; the hyaline spaces between the rivulets are as follows: 1. An oblique band, interrupted upon the third longitudinal vein, the anterior part of which forms, immediately beyond the stigma, a spot extending from the costa to the third longitudinal vein, while the posterior part of the band occupies the portion of the basal cell which lies under the stigma, the basis of the discal cell and the second basal cell; 2. A broad S-shaped band, which begins at the posterior margin, between the tips of the fifth and sixth longitudinal vein; passes between the two cross veins, reaches the second longitudinal vein, turns backward and reaches the margin in the vicinity of the end of the fourth longitudinal vein; 3. A large triangular spot near the posterior margin, which fills a considerable part of the second posterior cell, reaches with its tip considerably beyond the fourth longitudinal vein, and almost coalesces here with the S-shaped hyaline band. The external costal cell also is hyaline, with the exception of its basis, but has a more yellowish tinge than the other hyaline spaces. Stigma rather long, almost imperceptibly darker than its surroundings. Cross veins straight and steep, the third longitudinal vein distinctly bristly; the end of the fourth longitudinal vein turned forward; the posterior end of the anal cell drawn out in a very narrow, long lobe."

LIFE HISTORY AND HABITS

Egg.—The eggs are deposited in from 9 to 12 days after emergence of the adult. They are whitish in color, long and slender, and somewhat fluted. They are inserted beneath the cuticle of the fruit by the sharp ovipositor of the female. One female, confined in a large glass globe and well fed, deposited about thirty eggs nine days after emergence and about twenty more three days later. Probably the average number deposited by each female is about fifty to seventy.

The period of incubation has not been satisfactorily determined. It is about four days, but may be more under certain con-

ditions. The development of eggs deposited in green fruit may be retarded as much as one month.

Larva.—The life of the larva is about six weeks, but this may be prolonged under certain conditions such as green fruit rind, or it may be shortened by a lack of food. Pupae formed prematurely, owing to a deficiency in food, seldom or never produce flies.

During the first two or three weeks the larvae, in citrus fruits, live in the rind and enter the pulp only during the last few weeks. In grapefruit the larvae may live in the rind even longer. Almost mature maggots have been found in burrows in the rind. In fruits lacking a thick rind, as mangoes and guavas, they may be found in any part of the pulp.

As they work into the pulp of citrus fruits the larvae break up many juice sacs and sometimes a good deal of free juice collects in a badly broken-down area. The larvae avoid these small pools by burrowing through the solid pulp. It is not unusual to find a number of maggots—sometimes as many as five, or even eight—in one section of the pulp and none in the other sections.

It is peculiar that by far the greater percentage of the larval burrows in the rind are either at the calyx end or around the stem. From these two regions they enter the central column, and then the juice portion. The fruit does not drop off the tree until the central column has been attacked, and decay has set in. This loosens the connection of fruit and stem and they fall apart. Many thousand fallen grapefruit were cut open and about 90 per cent were burrowed at the stem or calyx end and the central column in all was affected. On the other hand, about two thousand supposedly good grapefruit which were clinging to the tree were opened and about fifty in this lot were found to contain maggots, but they had entered directly from the side and apparently had not affected the central column.

The same phenomenon occurs in other ways. Stem-end rot causes the fruit to drop by breaking down the central column. Navel-end rot of navel oranges does the same thing. Oranges with a large decaying spot at one side may be seen clinging tightly to the tree, while others with little external rot drop off. Some oranges and grapefruit affected with anthracnose drop off while others cling to the stems. This is due probably to the same cause.

The larvae need air within the fruit. For several weeks they seem to find a sufficient supply, but before they reach maturity

they secure more by burrowing to the surface and returning again to feed. The "turning-back" from the surface is sometimes through the same passage by which they come out, and sometimes by another burrowed back from the same point on the surface. These holes give the impression that the maggots have left the fruit, but it is usually about a week after this that they come out for pupation. It is possible that these are not airholes, but instead are exits made before the weakened prepupal stage comes upon them. Occasionally, a fruit may be found without such holes and with compressed gases of decay within. In such fruits, the maggots are usually all dead.

It seems to matter very little whether the fruit is decaying badly or not. The maggots thrive as well in badly decayed fruit as any other, provided the gases are allowed to escape. They were found to begin emerging from grapefruit from four to six days after it had dropped from the tree, and the emerging of larvae continued from the same lots of fruit for nearly one month. By that time, the fruit was very badly decayed.

After about six weeks, the maggots come out of the fruit and enter the ground to pupate. They burrow down from one-quarter to one-half inch, or sometimes as much as two inches below the surface. They may pupate immediately beneath the decaying fruit without entering the ground, or they may crawl into some other protected location. In a packing house they simply pupate on the floor or in the bottom of a box. The atmosphere of the tropics is sufficiently moist to prevent their drying out. In a dry climate such as southern California, they would probably dry out and perish, and this view is supported by the results of some artificial experiments.

Mr. T. E. Holloway, of the Bureau of Entomology, noted a gradual decay of infested grapefruit. After the maggots had emerged from gathered fruit which was placed on soil in breeding cages, the fruit molded and rotted, and in a few weeks it had "collapsed" and was "lying almost flat on the soil like a pancake." Having completely rotted, the fruit gradually dried up, in about a month being "black, dry and hard." The surface at this stage was covered with small dipterous puparia, forming an integral part of the decayed fruit. These puparia were apparently those of fruit flies *(Drosophila* spp.), the adults of which had been present in large numbers. The flies of *A. ludens* emerged after this long process, at least one fly having pupated

in the soil just under the rotting fruit. The soil under the fruit was found to be packed in a solid mass, having been saturated with the juices of the fruit and then drying out.

The final changes from the prepupa to the pupa require only about an hour. The maggot wriggles around until a suitable place for pupation is found, and then the body becomes quiescent. The body wall becomes smooth and more opaque. The ends draw in and become rounded and the diameter increases somewhat. The opaque color darkens gradually to light brown which darkens more and more during the following days.

Pupa.—The duration of the pupal period is from twenty-five to thirty days in winter, and from twenty to twenty-five days in summer. At first the puparia are dirty white or light brown and after several days they become brown. A dark brown color is not attained until just before emergence of the adult. Puparia in sunny exposures, or subjected to moderate heat such as 100 degrees Fahrenheit, become dark brown in a short time. The spiracular plates are conspicuous as two darker points.

The pupae are very sensitive to warmth. Many pupae were subjected to a heat of 110 degrees F. for one hour and none lived through it. None produced adults. A considerable percentage of pupae, for various reasons, fails to develop into adult flies, since out of one lot of 140 puparia 38 were unproductive.

Adult.—The adult fly emerges from the puparium by rupturing the latter at the anterior and longitudinally. Sometimes there is only a slit left, and sometimes part of the end is broken away in emergence.

At emergence the ovipositor tube of the female is very short, but within ten minutes it expands to half its normal length. In thirty minutes more it has gained its full normal length. The wings expand within a half hour from the time of emergence, but are very pale in color. The normal coloring of the wings is not attained until three or four days later. The frontal swelling is very prominent and large, and does not subside until one hour after emergence. During the first half hour the fly is busy dressing its wings and adjusting itself. As soon as the wings are fully expanded it rests for an hour or more. In cases where there is not sufficient moisture to permit the expansion of the wings, the fly is crippled and does not live long.

One of the earliest activities of the flies, after their brief rest, is feeding. They fly from the ground to the nearest host tree and

walk around over the leaves and fruit, feeding on the particles of sweet matter that they find. In the laboratory, they soon find the sugar that has been placed near them and greedily devour it. Their preference for different kinds of food varies. Several flies of both sexes were confined in a large glass globe, in which was placed orange peel, banana peel, pineapple, and sugar syrup. One passed the syrup and orange to get to the banana, while another passed almost over the banana to get to the syrup. A pile of ripe or decaying oranges or grapefruit will attract adults from a radius of many yards. A cut or bruised orange in a tree attracts the flies from other parts of that tree.

Mating of male and female flies occurs a few days after emergence. There is no exact data on this point as yet. Flies confined in a small place together attack each other by sudden and swift darts. In all instances observed, the female killed the male after about two to four days of battle. It is probable that copulation occurs some time before the killing of the male. Whether this has any bearing on actions in their natural state has not been ascertained.

Egg laying occurs in from nine to twelve days after emergence of the flies, and these eggs are deposited singly or in small groups just beneath the cuticle of the fruit. Each female deposits from fifty to seventy eggs, and a single female may thus infest a considerable number of fruits. The female flies, at the time of oviposition, walk about over the surface of the fruit and leaves, raising and lowering the long abdominal tube, which is provided with a needle-like ovipositor by means of which the eggs are deposited beneath the surface.

In the laboratory females oviposited a second time a few days after the first oviposition, but this may not obtain under field conditions. It is probable that the oviposition period of each fly, under natural conditions, continues for several days. The adults live about a month.

Many facts concerning the selection of a site by the female flies for oviposition, have been noted. They have not thus far been observed to deposit eggs in fruits other than those listed on page 269. Moreover, they have not been found associated with any other kind of tree. Mulberry trees, for example, growing among grapefruit and many other kinds of trees and shrubs, were searched carefully many times without disclosing the flies. Anthracnose, or "withertip," is of common occurrence in these southern citrus districts and many of the grapefruit and oranges

are spotted and pitted by the disease in a bad year. It is a singular fact, however, that very seldom are these diseased fruits found wormy. The wormy grapefruit are nearly always the largest and finest ones.

After oviposition the flies feed as before, the length of life depending largely on food supply and climatic conditions. Flies fed in the laboratory lived from twenty-five to thirty-three days with an average of thirty days. Some, however, died after twelve days although they received the same treatment as those which lived longer. Flies which received no food at all died in from three to six days. Heat is very injurious to the orange fruit fly. They avoid direct sunshine in the hot part of the day. It has been found that they may be killed by even that amount of heat.

Although at certain times maggots are plentiful in the fruit, flies are never abundant and one must, as a rule, search carefully for several minutes during the heat of the day before he finds any. It is evident that prevailing climatic conditions produce a uniform reduction of the number of adult flies from year to year. The high mortality of pupae and maggots, mentioned above, accounts partially for this. If it were not for this natural balance the infestation would increase each year at a tremendous rate. In the gulf region the percentage of infestation is comparatively low and from observations does not appear to increase at an alarming rate, from year to year.

THE GENERATIONS OF AN ENTIRE YEAR

The average length of time occupied by one generation is 90 days. There is apparently no indication of a prolonged resting period between generations. Four broods develop in a year, but the periods are not sharply defined. In some regions it is difficult to recognize the successive generations, but in others they are somewhat more distinct with a limited degree of infestation between generations.

Observation in citrus orchards in the eastern gulf coast region, from May, 1913, to May, 1914, have shown that in January and February the largest infestation of maggots in grapefruit occurs. This fruit is at its best in these months but is removed from the trees by the end of March or middle of April. The flies developing from this generation of maggots emerge in February and March, and oviposit after a few days in grapefruit. Oviposition will continue as long as there are any grapefruit available. In some orchards, by the latter part of March, there are no

grapefruit, and the flies oviposit in late oranges which may be on the trees until the end of April or even into May. Before the maggots of this second generation can reach maturity, most of the fruit is removed, thereby destroying a large percentage of the immature maggots which are located in the rind. Some of the ovipositions of March will result in the larvae reaching a stage sufficiently near maturity to cause the fruit to drop before the final "stripping" of the trees for market. Therefore, it is assured that some larvae of the second generation will reach maturity and pupate.

The second generation of flies, much reduced in numbers, appears in June and early July, at a season when there is very little citrus fruit in the orchards. There are usually a few off-bloom fruits ("June-blooms") still hanging on the trees in the summer months. These furnish a place for oviposition made during the summer months for an infestation of maggots in other fruits outside of the citrus orchards, but no traces of infestation were found. In one orchard, a small number of guavas were found to contain maggots of this fly. In another, wild plums were found to harbor the larvae. Around most of the orchards, however, there was no infestation of other fruits either wild or cultivated.

In many cases, flies appearing in June and July find no past-season fruits and oviposit in the only variety that offers green fruit. At this season the fruit is more than half green. The grapefruit is edible although not ripe in August or in some years even in late July. The eggs deposited in the green fruit are greatly retarded. These grapefruit maggots reach maturity in from four to six weeks later than do the maggots in the "June-bloom" fruit. The flies from the latter emerge in very small numbers in later September and October, while those from the larvae in green fruit appear in November.

The first-brood flies of the third generation oviposit in grapefruit during October. The infestation is not serious owing to the limited number of flies. The adults of the fourth generation developing from these maggots appear in late December. The second-brood flies of the third generation oviposit, also, in grapefruit in December. The maggots developing from these eggs reach maturity in late January and February—the generation of larvae with which we began.

Summary.—There are four generations in a single orchard each year. The third generation consists of two broods about six

weeks apart, the separation in the time being due to the kind of fruit in which the second generation of flies oviposit. The first brood of this generation amounts to very little or nothing because of their small numbers. The second brood amounts to more and gives rise to the first generation of the next year. While there are four generations of each year, yet there are only three of importance, the second brood of the third generation being more important than the first brood and giving rise to the first generation of the following year. The retarding of the egg incubation in green fruit constitutes a short resting period.

The adult flies appear in March, June, September, November and December. The September and November lots are the two broods of the third generation. The worst infestation of maggots is in January and February. The infestation from the second-brood maggots of the third generation in October is sometimes rather bad. It must be understood that these generations are not sharply defined. The regularity of the fruit marketing and consequent destruction of maggots at certain times has made the generations less overlapping than in some other regions of Mexico where these practices are not so carefully followed.

There is ample evidence that the July flies oviposit in green fruit. Very careful watch was kept in one large orchard during August and September. No flies were found after early July until September 20, at which time the first brood of the third generation began to appear. On August 10, a large number of grapefruit was picked from this orchard and stored in an insect-proof room. About October 3, some of the grapefruit began to drop from the trees because of maggot infestation. The fruit picked and stored in August was found at this time to be infested with mature maggots, thus showing that oviposition had taken place before the date of picking. The fact that no flies were found after early July indicates that this oviposition was at that time, and the larvae did not reach maturity until October, a period of at least ten weeks and perhaps longer if oviposition was earlier.

DISSEMINATION

This pest is disseminated in several ways: (1) In transported fruit; (2) carried from place to place in manure; (3) in the soil about nursery trees; (4) by winds blowing adults about. The first agency in dissemination is the most important; the second and third means of dissemination are easily possible, but prob-

ably account for little in the present distribution, while the fourth agency may be of considerable importance, but indications are to the contrary.

The first means is of chief importance in the spreading of the pest. Fruit is carried from place to place and from city to city and thus the orange fruit fly becomes established in a wider area.

Local distribution of the insect is sometimes peculiar. For example, two citrus orchards near Tampico have had a relatively bad infestation of the pest for several years past, while three or four other orchards directly between these two have had but slight infestations. In these cases the fact seemed to be explainable in this way: The two infested orchards are relatively large and there is apt to be some fruit during the summer months to hold the fly through until the fall crop materializes, while the other orchards are smaller and have less summer fruit and the pest can not become established. Small wooded areas separate the smaller orchards from the larger. This is an indication that the adults are not carried much by winds. As further evidence of this, the adults do very little flying and that is only over very short distances. It seems difficult for the wind to get hold of them, therefore, to transport them over larger areas. As further evidence of this, grapefruit growing near burying pits, where wormy fruit had been disposed of several months previous, were badly infested, while those growing a little farther away (about 150 yards or more) were not infested. It would appear that the flies were able to travel short distances when attracted by the odor of fruit. Again, the writer has noted several times that piles of waste oranges several hundred yards away may attract these fruit flies by their odor. How far this is effective has not been determined.

CONTROL BY NATURAL AGENCIES

A large percentage of the larvae of the fruit fly fail to pupate, and a considerable percentage of the pupae fail to produce flies. Mortality through natural causes reduces the numbers of this insect to a surprising degree. In many regions it never increases beyond the point where 1 to 5 per cent of certain fruit crops are affected, although no artificial control measures are practiced.

Insect enemies.—Parasitic insects play an important part in the control of the orange fruit fly, so far as present knowledge

goes. A braconid *(Diachasma crawfordi)*[1] has been mentioned by several entomologists as a parasite of the fruit fly maggots, and has been found frequently in Morelos, but thus far has not appeared in the Gulf region. Careful rearing experiments were carried on during a large part of the year in Morelos, but no parasitic insects were discovered.

A large ant, frequently found in fruit orchards and exhibiting carnivorous habits, was found to carry the larvae of *A. ludens* from out the fallen fruit and also to pick them up from the ground when they emerged from the fruit to pupate. Any other kind of maggots and larvae seemed to be as palatable to this ant, however. The value of these ants, as factors in repression, can not be accurately measured, but appears to be of minor importance at present. Predacious beetles seem to be little concerned with this insect.

Fungous enemies.—One puparium was found to be filled completely with spores of a fungus. Cultures were started from these spores, but the termination of the work did not permit the determination of this fungus.

Other enemies.—Birds play a considerable part in reducing this fruit fly by eating the puparia and larvae. Chickens and turkeys are important agents in this work also.

As in the case of most insects, the larval form of the Mexican fruit fly is subject to great mortality through extremes of temperature, but this phase of investigation has not as yet been fully developed.

Larvae have been found dead within fruit which had lain in the hot sun for most of the day, when the maximum temperature did not exceed 100 degrees, but it must be considered that with an air temperature of 100 degrees F., the temperature of the ground would approximate at least 140 degrees F., at which degree larval mortality would ensue.

A close relationship exists between maximum temperatures and the development of this insect. In the Tampico district during August, 1913, the temperature attained a maximum of 104 degrees during three successive days. The infestation of the flies was decidedly lighter during the fall of that year than had been

[1]This is the same insect that has been called *Cratospila rudibunda* by the Mexican entomologists and others who accepted their data. I sent some specimens to Coquilett, who named it *Diachasma* sp. (of. Crawford '10). Later the species was named by a French entomologist as *Diachasma crawfordi*. This species occurs also in Central America.

known for many years. The maximum temperature for that region very seldom exceeds 100 degrees F., and the government weather report shows that from 1903 to 1908, inclusive, a temperature of 100 degrees F. was reached only twice—in April, 1905, and May, 1908.

In more northern regions it is dry and hot, the weather in general resembling that of the southwestern United States. The Mexican fruit fly has been unable to establish itself in these regions, although it is constantly being introduced in oranges and other fruits brought from the south. The higher temperatures would thus appear to have prevented its becoming established.

In a relatively cold temperature (35 to 50 degrees F.), the flies become stupid and the larvae and pupae naturally require a longer period for development. The minimum temperature in the eastern Gulf region is 35 degrees, although this minimum is very rarely reached. The length of time required for the development of an entire generation in winter is naturally much longer than in summer. In Montemorelos, on the eastern slope, there was a decided drop in temperature in 1906 which resulted in the freezing of citrus trees. The thermometer registered a minimum of 27 degrees F., killing the foliage of delicate trees and shrubs. For at least four years after that time there was no evidence of infestation by the orange fruit fly,[1] when in 1911 it gradually became reestablished. The infestation in 1913-1914 was slight.

CONTROL BY ARTIFICIAL MEANS

The orange fruit fly, in the absence of natural or artificial repressive factors, increases in numbers to a certain extent, varying with the prevailing natural conditions of each region, and does not increase appreciably beyond that point. However, to reduce the fruit fly to a minimum and to secure sound, wholesome fruit, artificial means must be adopted. There are several means to be employed to this end, such as spraying, clean culture, traps, disinfectants and utilization of barnyard fowls.

Clean culture.—The first method of eradication which presents itself strongly against the fruit fly is the destruction of the maggots by removing and destroying the fruit which harbors them. It would seem that such a method should succeed in

[1] Statement of Mr. Arnulfo Berlanga, ex-mayor of Montemorelos, N. L., one of the chief citrus fruit growers, and a very trustworthy gentleman.

eradicating the pest if carried out thoroughly, since the destruction of maggots prevents the emergence of a future generation of adult flies. The difficulty in this course lies in destroying all of the infested fruit. It is not within the range of human possibility to destroy all infested fruit, since much of it, when shipped or sold, shows no external evidence of infestation. Again, assuming that all infested fruits were destroyed, the pupae in the ground from the previous generation will emerge and on not finding their accustomed host fruit will oviposit in some other kind of fruit. In other words, they will be forced by these repressive methods to adopt other host fruits. This condition has already taken place in Hawaii, in the case of the Mediterranean fruit fly.

Clean culture methods are decidedly beneficial if not carried to the extreme. It was advocated by some individuals in Mexico that for a period of two years the entire crop of oranges, mangoes, guavas and the other host fruits of the Mexican orange fruit fly be destroyed, to the end that the pest would be starved. This is an extreme application of the method of clean culture and, under average conditions, impossible.

The system of picking up all fallen fruit, on the assumption that most of it contains maggots, is of direct assistance in controlling the pest, and is one of the earliest recommendations of the Mexican government against the Mexican fruit fly. It has been practiced for many years against the apple maggot *(Rhagoletis pomonella)* and other fruit flies. Reducing the number of maggots that are able to mature and produce flies is a step forward in pest control, but it must not be thought that this method alone will be successful.

How often the infested, fallen fruit should be gathered from the ground for destruction depends entirely on the length of time between the dropping of the fruit and the emergence of the first maggots for pupation. This has been determined during the past year to be four days, in the case of citrus fruit. Grapefruit and oranges, therefore, must be picked up every four days, or twice each week, if this method is to be in any considerable degree successful in controlling the pest.

In commercial practice, it is usually thought to be impracticable to pick up fallen fruit twice a week, owing to the attendant expense. In a large orchard it is expensive, and, unless the results are considerable, the work does not pay. The fruit grow-

ers were urged to pick up all fallen fruit at least once every week, and oftener if possible. Although the first maggots emerge about four days after the time of dropping of the infested fruit, the greater percentage emerge from seven to twelve days after fruit dropping, and some as late as thirty days after.

The fruit thus picked up may be buried or burned—it must not be fed to hogs, for the maggots may pass through the hogs alive and produce flies. In some cases, it is easier to burn the fruit or boil it. Incinerating furnaces have been constructed in Morelos to dispose of this fruit. It is thrown on a grate under which a fire is maintained, and, unless there is cheap fuel available, this method is not to be recommended. The easier method of disposal is to dig a large, deep hole and throw the wormy fruit into this for three weeks, after which it must be covered with about two feet of dirt and well trampled. A quantity of lime should be placed in this hole before filling. The maggots of the fruit first deposited in the hole will require at least thirty days before they emerge as adult flies; therefore, it is perfectly safe to leave the hole open for from twenty to twenty-five days.

Great care must be taken to fill the hole with sufficient soil at the proper time, as Mr. McDonald, near Tampico, had trouble from carelessness in this respect on the part of his men. Holes not sufficiently covered became sources of infestation to grapefruit, sometimes as much as 300 feet distant.

A concrete case of the effectiveness of clean culture alone may be seen in the following statement: One citrus fruit grower near Tampico picked up the fallen fruit in his ten-acre orchard every Monday, but sprayed his trees with "poison-bait" only twice during the season. Enough flies were produced, in spite of his clean culture practice, to cause an infestation amounting to about 10 per cent in February, 1914. A neighbor of this man, living about two miles away, had about an equal infestation in his orchard in 1912-1913, prior to the beginning of this investigational work. In 1913-1914 he cleaned out the fallen fruit from his orchard once every week, and in addition, sprayed once every ten days with poison-bait. As a result, about one-fifth of 1 per cent of his fruit was infested with maggots. Clean culture alone, therefore, is of little avail, but if accompanied by other means of control it is beneficial. Whether or not the destruction of infested fruit could be dispensed with in case poison-bait spraying was carefully done has not been determined.

Poison-bait.—It has been ascertained that a period of from eight to twelve days intervenes between the emergence of the fly and oviposition in the fruit. During this time the flies eat any sweet substances that are available. If a quantity of sweetened poison is kept on the foliage and fruit of the trees when the flies are present they will eat enough to kill them before oviposition commences. Thus, the fruit will be protected against infestation, and the numbers of the fruit fly will be reduced.

The fruit flies feed after the manner of the house fly, being equipped with a similar labellum with which they take up any fluid that attracts their attention. In view of these feeding habits it is necessary to apply poison in such a form that it can be taken readily by the flies. It may be in liquid form, in traps, or sprayed onto the foliage and fruit.

The best form in which to apply the poison is in a sweetened liquid, known as poison-bait. A form of arsenic, usually lead arsenate, is thoroughly mixed with cheap sugar syrup or cane syrup and diluted with water. This liquid is then sprayed on part of the foliage and fruit of each tree. It is not necessary to moisten every leaf nor every part of the tree. While this may be applied by a man with a hand sprayer, others have used a power sprayer, with good results, spraying two rows of trees with a single outfit.

The formula used in the control work in the past season was as follows:

Lead arsenate	1 pound
Cheap brown sugar (peloncillo)	6 pounds
Water	20 gallons

The cost of this spray mixture was small. The lead arsenate was imported from the United States and cost the grower about 20 cents a pound. The brown sugar in Mexico costs about 2½ cents per pound, or 15 cents for six pounds, twenty gallons of spray cost about 35 cents, and covered about 100 trees—a cost of about .0035 cent per tree.

One spraying will not be sufficient, since the poison is washed off by rains, fogs and moisture, making it necessary to renew the spraying at frequent intervals, depending upon weather conditions. In fine weather, applications of spray every two weeks, or perhaps three weeks, are sufficient, but in rainy weather it will be necessary to spray once every ten days or perhaps oftener. Distinct traces of poison-bait were found in orange trees

after three very hard rainstorms, which would indicate that the arsenate of lead syrup after it has once thoroughly dried on the leaves is not easily washed away.

It is necessary to determine, both by schedule and observation, when the flies are present in an orchard before the spraying with poison-bait begins. In a former paragraph the times of appearance of the fruit flies in the Mexican Gulf region are given. The periods during which spraying must be done are: Late September to late December, and perhaps in July. (See Table 1.)

By close and frequent observation the flies can be located, although they will be difficult for the average grower to discover.

The success of this control method depends wholly on the care which is exercised in maintaining a systematic and constant supply of poison during the time in which flies are present. Indifferent sprayings will not meet with success.

This method has proved very successful and commercially practicable in the east coast region of Mexico during 1913-1914. Entire orchards have been protected to the extent that no visible infestation was present in the fruit, or sometimes one-fifth to one-half of 1 per cent of the fruit was wormy. These results were obtained in a year when troubles incident to the war interrupted the work, when orchards had to be abandoned periodically and laborers were difficult to hold.

Mr. A. E. Graham, living 125 miles north of Tampico, began spraying his citrus trees on October 3, 1913, when the fall brood of flies were first observed on his trees. From October until the following February he sprayed about once in ten days. His fruit showed no infestation by maggots during winter and spring.

Others would have secured equally good results had it not been for the fact that they were forced to abandon their orchards at times because of the war. However, a few abandoned their places for only short periods and the results of spraying were very encouraging. Mr. G. N. McDonald lost about one-fifth of 1 per cent of his crop from January, 1914, on through that season. The large orchard, 600 acres, supervised by Mr. W. M. Hanson, was the place on which much of the experimental work was carried on. Unfortunately this had to be abandoned for several months after the middle of November and the results of most of the work started there were lost.

TABLE 1.—SCHEDULE SHOWING LIFE HISTORY AND CONTROL THROUGHOUT THE YEAR IN THE EAST COAST REGION.

Month	Weather Average 1903-1908 (Tampico)	Crop	Stage of Insect	Degree of Infestation	Control Methods Recommended
January	Rain 3.09 in. Max. 78° Min. 51°	Grapefruit or oranges	Larvae abundant. Few adults.	Bad—worst of year.	Destroy fallen fruit. Spray poison bait on oranges and trap grapefruit trees especially.
February	Rain 1.96 in. Max. 79° Min. 47°	Grapefruit or oranges	Larvae abundant. Pupae abundant. Few adults.	Bad.	Destroy fallen fruit. Spray late oranges with bait.
March	Rain 1.55 in. Max. 82° Min. 58°	Grapefruit or oranges	Adults abundant. Some pupae. Some larvae.	Moderate.	Spray every 10 to 20 days. Strip off all grapefruit.
April	Rain 0.95 in. Max. 88° Min. 64°	Oranges	Larvae many. Some pupae. Many adults.	Moderate to bad.	Destroy all fallen fruit. Market all oranges if possible.
May	Rain 3.81 in. Max. 91° Min. 71°	Oranges	Few larvae, pupae and adults.	Slight (reduced by scarcity of fruit).	Strip off all oranges from trees. Clean up orchard.
June	Rain 5.05 in. Max. 88° Min. 72°	Oranges	Few pupae. Few adults	Slight.	Secure spray material for next campaign. Repair sprayers.
July	Rain 3.62 in. Max. 88° Min. 73°	Green grapefruit	Few adults ovipositing in green grapefruit.	Very slight.	Spray with poison bait, especially grapefruit trees about 1st, 10th and 20th of month.
August	Rain 9.24 in. Max. 87° Min. 72°	Grapefruit	Eggs and young larvae in green fruit. Pupae from off-blooms.	Very slight.	Destroy fallen fruit limited in amount.
September	Rain 7.09 in. Max. 87° Min. 70°	Grapefruit	Larvae in ripening fruit. Few adults from off-blooms.	Slight.	Spray grapefruit trees about 20th of month. Destroy fallen fruit.
October	Rain 6.45 in. Max. 87° Min. 65°	Grapefruit or oranges	Larvae from July oviposition. Pupae of some. Few adults.	Moderate	Spray grapefruit trees every 10 to 15 days. Destroy fallen fruit.
November	Rain 5.17 in. Max. 85° Min. 53°	Grapefruit or oranges	Pupae of July oviposition. Many adults from same. Larvae from Sept. oviposition few.	Slight.	Spray grapefruit trees every 10 to 20 days. Leave trees when picking grapefruit. Destroy fallen fruit.
December	Rain 3.56 in. Max. 78° Min. 52°	Grapefruit or oranges	Adults rather abundant. Few larvae. Few pupae.	Slight.	Spray grapefruit and orange trees every 15 to 20 days. Market as many grapefruit as possible. Leave trap grapefruit trees.

Is this spraying method practicable? It was computed in a paragraph above that the materials cost about .0035 cent per tree, or about 25 cents per acre (orchards in Mexico are set out about 70 trees to the acre). Mr. Graham, mentioned above, used a barrel sprayer on a light wagon, one mule and four men—one to drive, one to pump, and two to spray. With this equipment he was able to spray 200 trees per hour. This labor cost him about $4 per day of about eight or nine hours, or about 50 cents per hour, or one-fourth cent per tree, or about 20 cents per acre. Added to the cost of materials, this makes a total of 45 cents per acre or 60 cents per 100 trees. Mr. Graham sprayed about twelve times, making a total cost for the season of about $5 per acre. Not only is there a saving in the amount of fruit marketable, but also in making the prices for all the crop higher because of the guarantee of soundness of the fruit.

Mr. Hanson used a power sprayer for applying the poison-bait. Three men did the work, one driving the four mules, and two handling the nozzles. They were able to spray about 300 trees per hour. The labor of the men and mules, the gasoline and the materials for the spray totaled about 40 cents per acre, or 55 cents per 100 trees—almost the same as by the slightly slower method. Mr. McDonald used a hand sprayer on his orchard. One man with the knapsack sprayer could spray about 60 trees in an hour, allowing for time to refill the sprayer occasionally. This made a total cost of about 35 to 40 cents per acre, or 50 to 55 cents per hundred trees.

Bees have been said to suffer by this poison-bait spraying. This is largely exaggerated, for the bait is not in such a condition that it can be eaten by the bees, except when it is first applied. Accurate observation has shown that little or no loss is occasioned in this way. Fruit is not poison for eating, for the poison is present in such minute quantities that it can have no injurious effect on humans. All fruit should be brushed or washed before shipping, whether it has been sprayed with bait or not.

Traps.—Several ingenious types of traps for flies were under investigation, but, owing to internecine conditions, the incompleted experiments had to be terminated.

Trap crops.—Growers in the East Coast region were strongly urged to plant and leave a few bearing grapefruit trees among the other trees. This fruit fly exhibits a marked preference for

grapefruit in which to oviposit, and will ignore all other fruits if it is available. A few grapefruit trees among other fruit trees will usually receive all the oviposition of the flies, thus freeing the other fruits from infestation. By destroying all the fallen fruit from those trap trees at intervals of a few days and keeping a good supply of poison-bait on the trees, there will be a marked decrease in the number and damage by the fruit fly.

KILLING THE MAGGOTS WITHIN THE FRUIT

The larvae within the fruit rind can be killed without injuring the fruit. This will have an important bearing on the quarantines against this and other similar insect pests. Most of the larvae within the fruit can be killed by exposing the fruit to hydrocyanic acid gas for two or three days in a tight room. In the tests thus far made it has not been possible to kill all the maggots. Experiments have been made in small, nearly air-tight boxes, and also in railroad box cars which were not air-tight. The average dosage was 6 oz. of potassium cyanide per 100 cubic feet of space.

The fruit was exposed to the hydrocyanic acid gas for from forty-eight to seventy-two hours. It was found that if the fruit was opened immediately after being removed from the gas chamber the larvae were all comatose or inactive. Left in the open air a few of the larvae recovered and pupated. However, if the fruit was not opened for forty-eight hours after being removed from the gas chamber, it was found that in most cases the maggots were dead, although in a few instances active larvae were found in such fruits.

It is certain that fumigation can not be accomplished in ordinary freight cars, owing to the leakage of gas. Two fumigation tests were made in Tampico and in both cases only about 50 per cent of the larvae were killed. In an air-tight room, however, it is possible to kill all larvae by fumigation. Sound fruit is not injured by this treatment. Fumigated fruit was found to "keep" just as well as unfumigated fruit and was not affected in the least for eating.

Fumigating in a partial vacuum with hydrocyanic acid gas has been found by Mr. E. R. Sasscer* to be successful in killing

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*"A Method of Fumigating Seed," by E. R. Sasscer and Lon A. Hawkins, Bulletin 186 of the U. S. Department of Agriculture, February 27, 1915.

weevil grubs and other larvae in seeds. The vacuum fumigation method can be used successfully on imported fruit to kill the maggots of the Mexican orange fruit fly and similar insects.

For vacuum fumigation of imported fruit it will be necessary to construct at convenient points—probably several of the ports of entry—fumigating chambers substantial enough to permit the air pressure within to be materially reduced. By this reduction of pressure, it becomes easy for the hydrocyanic acid gas to penetrate the fruit and kill the maggots within. It is said by Mr. Sasscer that one-half hour of fumigation was enough to kill larvae in avocado seeds.

Heating the fruit to about 115 degrees F. (46 degrees C.) is successful in killing all larvae within it, as well as the puparia. The fruit can be placed for about twenty-four hours in a warming room of the type used for banana ripening where the temperature can be well controlled. This does not injure the fruit, provided it be cooled again before shipment.

Fruit placed in a steam heater at a temperature of 110 degrees for only a few hours contained no living maggots upon being opened several days later.

For shipment of quarantined fruit into the United States and other places it would be possible to construct disinfecting rooms at the ports of entry[1] and allow all the fruit entering from a quarantined district to be thoroughly treated to the satisfaction of special inspectors. This would remove all danger from possible introduction of fruit flies, and at the same time permit these desirable fruits to enter our markets.

A very good suggestion for a possible heating room warmed by electricity is contained in the following extract from the Electrical Review and Electrician (Chicago, Illinois), March 22, 1913: "Banana-ripening rooms heated electrically have given very good results to a firm in Spokane, Washington. The rooms are 16 by 18 by 7 feet, with four 500-watt car heaters and a circulating fan placed in an asbestos-lined box on the four walls about two feet from the floor. In addition to this a 500-watt element is placed in a bucket of water, the evaporation of which furnishes the necessary moisture. Each piece of apparatus is controlled by an individual switch. The temperature does not vary more than five degrees in the different parts of the room."

[1]For additional safety, the ports of entry located in citrus growing regions should be closed to the importation of citrus fruits from the quarantined districts.

HISTORICAL SUMMARY

Previous to 1850 the "orange maggot," as it was termed, was known to infest oranges and mangoes in Morelos, a small tropical state just south of the city of Mexico. At this time little attention was paid to the pest, although it did considerable damage.

In 1873 the insect received the scientific designation, *Trypeta ludens*, and was described by an Austrian entomologist, H. Loew. About the only place it was known to exist at this time was in the state of Morelos, hence the name which has been attached to it, "Morelos orange worm."

About 1885, American travelers began to notice the maggots in oranges and gradually the knowledge spread. In 1888, Riley[1] published a short paper calling attention to this insect, part of his data having been obtained from the brief studies in 1887 by Bruner.[2] For several years after no additional research work was done. In the meantime orange shipments from Mexico into the United States began in increasing quantities and the maggot was again brought to notice. During 1894-1895, in Florida, these shipments increased, arousing more interest, and in 1897 Dr. Howard called attention to the danger of introducing the pest into Florida or California. About this time Mr. Alexander Craw of the California Horticultural Commission found the maggots in Mexican oranges shipped into California, and an investigation was commenced.

In 1899 California placed a quarantine against Mexican oranges and Mexican fruit growers immediately began corresponding with the authorities in California and Washington in an attempt to have the quarantine removed. In 1900, a Commission of Parasitology was established in Mexico to investigate the insect and report control measures. Prof. A. L. Herrera was placed at the head of this commission. Attempts to have the quarantine removed have resulted in failure to the present time.

Concerning the activities of the Mexican commission, Professor Herrera and his assistants in 1900 began an investigation and published circulars of information from time to time. Data were accumulated as to the distribution and extent of injury by the pest. Control methods were experimented on and advice and orders were sent out to the various districts concerned, and much

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[1]Riley, C. V.
[2]Bruner, Lawrence.

data on the distribution of the fruit fly were obtained by writing to the governors of each state.

The control methods advocated were several:

(1) Clean up all fallen oranges, mangoes, guavas, sweet limes and achras sapotes every few days and bury or burn them.

(2) Burn or bury all early oranges.

(3) Remove all hedges and substitute wire fences.

(4) Let chickens and turkeys scratch in the orchard to eat up larvae and pupae.

A statement was added to the effect that the vigorous carrying out of these orders in all parts of the Republic ought to result in the extermination of the pest in a few years. At a later date it was found that the adult flies could be poisoned by sprinkling the foliage with a decoction made from a poisonous native plant.

Haplophyton cimicidum.—While this work was progressing, efforts were still being made to have the quarantine removed in California. A request was made by Mexico that an agent be sent down by California to make a careful investigation of the status of the insect and of the control work being carried on. Accordingly, Mr. John Isaac was sent down in 1905, as a duly commissioned agent of the State of California. Mr. Isaac traveled over much of the country, in company with Professor Herrera, and accumulated much valuable data and information concerning the distribution of the insect and extent of injury by it. Unfortunately, he did not have time to verify the life history of the fruit fly and other data which he collected.

A complete report of Mr. Isaac's studies of the Mexican orange fruit fly was published in 1905, setting forth the history, distribution, life history, hosts and control methods. No definite advice was offered with regard to control work.

From 1905 to 1910 the control and investigational work and agitation gradually subsided. When the writer visited the citrus fruit districts of southern Mexico, he found the incinerating furnaces in a dilapidated condition and long unused, and little active control work in progress. The Commission of Parasitology had dissolved and Professor Herrera was engaged in other work. No one seemed to know much about the pest or its control, and but little opportunity was found for adding to the limited knowledge of the life history of the fruit fly, although some

suggestions were made for new control work. Several influential men in Mexico City attempted to bring new activity into the governmental investigational work, as a result of these studies, but nothing tangible came of it.

Not long after this a new Commissioner of Horticulture, Dr. A. J. Cook, was appointed in California and he renewed and strengthened the quarantine in 1911, prohibiting the entry of oranges, mangoes, guavas, sweet limes and achras sapotes from Mexico. From 1907 to 1910, vigilance in California had steadily diminished, and oranges were entering more or less freely. Finally, in 1913, a federal quarantine was enacted, prohibiting the entry of these same kinds of fruits into any part of the United States.

By this time the people in Mexico were thoroughly aroused and a body of fruit growers, Americans and Mexicans together, met in January, 1913, at Tampico, when, with the aid of the federal government and National Railway system, a cooperative association was organized for the primary purpose of employing an expert to study the orange maggot and devise successful means of control. For this work, as well as directing other work of the association, the writer was employed in May, 1913, at which point this bulletin begins.

SUMMARY

Control of the orange fruit fly is effected partly by natural agencies. Insect enemies play a relatively small part in this. Parasites have been found, but not abundantly. Predacious ants may prove to be important. Parasitic fungi give evidence of being important in controlling this pest.

Artificial control has been successful in East Coast region in the season of 1913-1914 by the following means: (1) Pick up all fallen fruit at least once every week, and oftener if possible, and bury or burn it; (2) spray the trees hastily with a sweetened poison-bait once every ten days during the fly season, or oftener if it rains hard. This poisons the flies before they are ready to oviposit; (3) have a few grapefruit trees among the other trees to act as traps for attracting oviposition, and then destroy the fallen fruit from these trees and keep the foliage sprayed with poison-bait.

It is probable that fruit can be fumigated with hydrocyanic acid gas in a partial vacuum and 100 per cent of the larvae with-

in it killed. If fumigated without a partial vacuum, 50 to 90 per cent of the maggots can be killed.

Fruit can be warmed to 115 degrees F. for about twenty-four hours and all the larvae within it killed. Neither of these processes is injurious to the fruit.

The host fruits of this pest are grapefruit, oranges, sour oranges, mangoes, guavas, achras sapotes and wild plums. There may be a few others. Grapefruit is the favorite of all.

The distribution of the insect is limited to Mexico and Central America, and perhaps northern South America. In the northern and more arid regions of Mexico it is not present. It is distinctly a tropical insect, and must have good humidity and a temperature not much over 100 degrees F.

Its economic importance is considerable. It affects, uncontrolled, from 2 to 75 per cent of certain fruit crops. In some localities it is of far less importance than in others; natural controlling agencies are more effective in some places than in others.

Fruit containing maggots can be detected from external appearances only after the larvae attain about two-thirds of their growth or more. Certain portions of the skin become more highly colored, and softer than normal. The fruit drops from the tree about a week before the larvae are mature.

Inside the fruit the evidence of infestation is more distinct. The rind of citrus fruits is burrowed and streaked with brown. Some sections of the pulp are broken down and filled with free juice.

The life cycle occupies about three months. The larvae live about six weeks; the pupal stage lasts about four weeks; ten days intervene between the emergence of adults and oviposition; incubation occupies several days.

In the East Coast region there is a generation of flies in March and April, another in July, a third in September and October, with another brood in November. Those of September and November are two broods of the same generation separated by a retardation in incubation or larval development in green grapefruit in July.

The insect is able to maintain itself throughout the year in a citrus orchard, with no other fruits to bridge over gaps. The summer gap is bridged over by "June-bloom" fruits left on the trees, and by green grapefruit.

Dissemination is effected by transportation of wormy fruit, as the flies themselves seem to travel very little and are seldom carried by winds.

OTHER TRYPETIDAE IN MEXICO

In his Catalog of North American Diptera, 1905, Aldrich lists sixty-eight species of Trypetids which live in Mexico, but by no means are all of these to be considered fruit flies, inasmuch as they do not all attack fruits. Many of them breed in stems of plants and many in unimportant wild fruits. Some of these are known only in very small and isolated areas of Mexico, while others are very widespread. Only a few species are of importance in agriculture, attacking fruits of economic importance. The chief of these is *Anastrepha ludens*, the subject of this bulletin, but another species of the same genus, *A. fraterculus*, is also of considerable importance.

Anastrepha fraterculus Wiedeman very closely resembles *A. ludens* Loew, being similar in color of wings and body, only a little smaller, and living in more or less the same regions as its relative. It is distinguished from the other by the shorter terminal abdominal segment of both the male and the female. In *A. ludens* the terminal segment of the male is longer than the two preceding segments together, while in *A. fraterculus* it is much shorter than this. The females are as easily distinguished, the latter having a distinctly shorter abdominal tube. In both male and female there is some difference between the two species in the venation of the wings.

Anastrepha fraterculus has been reared from guavas and mangoes in the State of Morelos and seems to be rather abundant in certain localities. In the vicinity of Jalapa a number were collected on orange and guava trees, in 1910, by the writer. It is quite probable that some of the damage attributed to *A. ludens* should be transferred to this closely allied species, for it is so similar that none but an entomologist would recognize the difference. Mr. Guillermo Gandara, a Mexican entomologist, inclines very strongly to this belief.

Two other undetermined species of Trypetids were found resting on oranges and grapefruit in an orchard in the state of Tamaulipas, but it is believed that these do not affect the fruit in any way. In the very large number of fruits that were used in breeding out the adult flies, none of these other species ever

appeared with the regular orange fly. It is probable that they breed in some wild fruits and these few happened to alight on the trees in this orchard.

The fruit of figs sometimes is infested with larvae of an Anthomyid fly, but this is not a real fruit fly. Relatives of this species often attack the roots of certain crops in this country and are commonly known as root maggots.

THE MONTHLY BULLETIN
State Plant Board of Florida

DEVOTED TO APPLIED ENTOMOLOGY AND PLANT PATHOLOGY IN GENERAL, WITH SPECIAL REFERENCE TO THE PREVENTION, CONTROL AND ERADICATION OF INJURIOUS INSECTS AND PLANT DISEASES IN FLORIDA. OFFICIAL ORGAN OF THE STATE PLANT BOARD OF FLORIDA.

Sent free to all citizens of Florida. Offered in exchange for publications of the Federal and foreign governments and experiment stations, entomological and mycological journals, agricultural and horticultural papers and other publications of a similar nature.

WILMON NEWELL, *Plant Commissioner*..*Editor*

ASSOCIATE EDITORS

E. W. BERGER..*Entomologist*
J. C. GOODWIN..*Nursery Inspector*
J. H. MONTGOMERY ....*Quarantine Inspector*
....*Plant Pathologist*

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DEPARTMENT REPORTS

NURSERY INSPECTION DEPARTMENT

NURSERY INSPECTOR'S SUMMARY FOR MONTH OF MAY, 1928

Number of nurseries inspected		1,155
Quantity of stock inspected:		
Citrus	8,080,476	
Non-citrus	18,813,232	
Total		26,893,708

BEE DISEASE ERADICATION

REPORT FOR MONTH OF MAY, 1928

Number of apiaries inspected	117
Number of colonies inspected	1,444
Number of apiaries infected with American foulbrood	5
Number of colonies infected with American foulbrood	20
Number of colonies destroyed	20
Number of apiaries infected with European foulbrood	0
Number of colonies infected with European foulbrood	0
Number of colonies treated	0

QUARANTINE DEPARTMENT

Quarantine Inspector's Monthly Summary

May, 1928

Ships and Vessels Inspected:			
From Foreign Ports:			
Direct	261		
Via U. S. Ports	52		
Total		313	
From U. S. Ports other than Florida		166	
From Florida Ports		50	
Total			529
Number of Parcels Inspected:			
Arriving by water:			
Passed		558,981	
Treated and passed		121,295	
Returned to shipper		529	
Contraband destroyed		405	
Total			681,210
Arriving by land—express, freight, wagon, etc..			
Passed		1,571	
Treated and passed		705	
Returned to shipper		0	
Contraband destroyed		3	
Total			2,279
Arriving by mail:			
Passed		286	
Treated and passed		4	
Returned to shipper		2	
Contraband destroyed		2	
Total		294	
Grand Total of Parcels Inspected			683,783
Number of parcels on hand pending determination as to final disposition			5

DEPARTMENT OF CITRUS CANKER ERADICATION

REPORT ON ERADICATION WORK IN COOPERATION WITH THE BUREAU OF PLANT INDUSTRY, UNITED STATES DEPARTMENT OF AGRICULTURE, FOR MONTH OF MAY, 1928

Citrus grove trees inspected	1,258,243
Citrus nursery trees inspected	0
Inspectors employed on citrus canker eradication	35
New properties showing active infection	0
Total properties showing active infection	0
Grove trees found infected	0
Nursery trees found infected	0
Counties in which active infections were found	0

GENERAL SUMMARY

Florida counties in which canker has been found	26
Grove trees found infected since May, 1914	15,243
Nursery trees found infected since May, 1914	342,260
Number properties found infected to May 31, 1928	515
Properties declared no longer danger centers	512
Properties still classed as actively infected, May 31, 1928	3

The following table shows the number of citrus grove trees found infected with canker during each month from the beginning of the eradication work to May 31, 1928:

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Tot'l
1914	....	....	....	....	108	160	275	1313	767	565	773	366	4327
1915	306	165	444	408	1042	772	651	1345	618	214	494	256	6715
1916	86	21	49	49	338	450	349	219	124	451	131	27	2294
1917	14	4	9	169	52	45	39	30	6	2	1	1	372
1918	0	1	1	2	1	10	0	0	0	0	0	0	15
1919	0	0	1	1	1	0	0	1	0	0	0	0	4
1920	0	0	0	0	0	0	539	1	0	0	0	0	540
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	585	168	28	34	23	19	12	4	873
1923	1	1	2	3	2	1	0	0	0	1	0	0	11
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	5	0	0	0	0	0	0	0	0	0	5
1926	0	0	0	0	0	0	0	0	0	0	0	2	2
1927	0	0	0	0	0	0	0	0	0	0	85	0	85
1928	0	0	0	0	0	...	...	...	..	...	...	.	....

WHITEFLY FUNGUS AVAILABLE

The Entomological Department of the State Plant Board still has some of the Red Aschersonia (Red Whitefly-Fungus) on hand for use in whitefly infested groves. Whenever weather conditions, plenty of wet weather, are present or imminent, growers should introduce this fungus early in order to give it plenty of time to do its work of destroying whiteflies. This fungus is an effective parasite of both the Common Whitefly and Cloudy-winged Whitefly.

A culture, the amount of fungus grown in a pint wide-mouth bottle, is sufficient for an acre of trees (large or small). Price is one dollar per culture, with transportation charges prepaid. Remittance should accompany each request for fungus, although c. o. d. requests, while not solicited because they are more troublesome and slightly more expensive, will be promptly filled.

PUBLICATIONS WANTED BY THE STATE PLANT BOARD

Revista de Agricultura de Puerto Rico (San Juan)

Vol. I (1918) No. 3. Vol. II ( ) No. 1.

Vol. III (1919) No. 5. Vol. VI (1921) Nos. 1, 6.

Vol. VIII (1922) No. 5.

Institute of Jamaica
Journal—Vol. I.

Societe Entomologique de France (Paris)
Annales et Bulletin. 1832-1857

Philippine Journal of Science (Manila)

Vol. III, Sect. A, No. 6. (1908)

Vol. VI, Sect. A, No. 2. (1911)
Sect. C, Nos. 1, 3.
Sect. D, Nos. 2, 5, 6.

Vol. VII, Sect. B, Nos. 1, 2, 3, 4. (1912)
Sect. C, No. 2.
Sect. D, No. 3.

Vol. IX, Sect. A, Nos. 2, 5. (1914)

Vol. XIV, Complete (1919)

Philadelphia Academy of Natural Sciences
Proceedings, Vols. 2, 6, 7.

Missouri. Reports of State Entomologist (Riley)
Reports Nos. 8, 9, Index

Buffalo Society Natural Sciences.

Vols. IV-X (1881——)

Those having any of the above for sale please advise. State price in your communication.

Library, State Plant Board,
Gainesville, Florida.

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